BayRS Version 14.00

Part No. 309249-14.00 Rev 00
September 1999

4401 Great America Parkway
Santa Clara, CA 95054

Configuring MPOA and NHRP Services

NORTEL NETWORKS™

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Preface

This guide describes Nortel Networks implementation of Multi-Protocol over ATM (MPOA) and Next Hop Resolution Protocol (NHRP) services, and what you do to start and customize these services on a Nortel Networks™ router.

You can use the Bay Command Console (BCC™) or Site Manager to configure MPOA and NHRP on a router. In this guide, you will find instructions for using both the BCC and Site Manager. Use Site Manager to support any feature not support by the BCC.

Before You Begin

Before using this guide, you must complete the following procedures. For a new router:

- Install the router (see the installation guide that came with your router).
- Connect the router to the network and create a pilot configuration file (see *Quick-Starting Routers*, *Configuring BayStack Remote Access*, or *Connecting ASN Routers to a Network)*.

Make sure that you are running the latest version of Nortel Networks BayRS™ and Site Manager software. For information about upgrading BayRS and Site Manager, see the upgrading guide for your version of BayRS.

Text Conventions

This guide uses the following text conventions:

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: If the command syntax is: **ping** <*ip_address*>, you enter: **ping 192.32.10.12**
bold text	Indicates command names and options and text that you need to enter. Example: Enter **show ip** {**alerts** | **routes**}. Example: Use the **dinfo** command.
braces ({})	Indicate required elements in syntax descriptions where there is more than one option. You must choose only one of the options. Do not type the braces when entering the command. Example: If the command syntax is: **show ip** {**alerts** | **routes**}, you must enter either: **show ip alerts** or **show ip routes**, but not both.
brackets ([ ])	Indicate optional elements in syntax descriptions. Do not type the brackets when entering the command. Example: If the command syntax is: **show ip interfaces** [**-alerts**], you can enter either: **show ip interfaces** or **show ip interfaces -alerts**.
ellipsis points (. . .)	Indicate that you repeat the last element of the command as needed. Example: If the command syntax is: **ethernet/2/1** [<*parameter*> <*value*>] **. . .** , you enter **ethernet/2/1** and as many parameter-value pairs as needed.

italic text	Indicates file and directory names, new terms, book titles, and variables in command syntax descriptions. Where a variable is two or more words, the words are connected by an underscore. Example: If the command syntax is: **show at** <*valid_route*> *valid_route* is one variable and you substitute one value for it.
`screen text`	Indicates system output, for example, prompts and system messages. Example: `Set Trap Monitor Filters`
separator (>)	Shows menu paths. Example: Protocols > IP identifies the IP option on the Protocols menu.
vertical line (|)	Separates choices for command keywords and arguments. Enter only one of the choices. Do not type the vertical line when entering the command. Example: If the command syntax is: **show ip** {**alerts** | **routes**}, you enter either: **show ip alerts** or **show ip routes**, but not both.

Acronyms

This guide uses the following acronyms:

AAL	ATM adaptation layer
AFI	authority and format identifier
ARE	ATM Routing Engine
ARP	Address Resolution Protocol
ATM	asynchronous transfer mode
B-ISDN	Broadband Integrated Services Digital Network
CSU	channel service unit
DCE	data communication equipment
DSU	data service unit
DTE	data terminal equipment
ELAN	emulated local area network
IETF	Internet Engineering Task Force
ILI	Intelligent Link Interface
ILMI	Interim Local Management Interface
IP	Internet Protocol
LANE	local area network emulation
LE	LAN emulation
LEC	LAN emulation client
LECS	LAN emulation configuration server
LER	label edge router
LES	LAN emulation server
LLC	Logical Link Control
MAC	media access control
MIB	management information base
MPC	MPOA client
MPLS	Multiprotocol Label Switching

MPOA	Multi-Protocol over ATM
MPS	MPOA server
MTU	maximum transmission unit
NHRP	Next Hop Resolution Protocol
OC-3	Optical Carrier-level 3
OSPF	Open Shortest Path First
PDN	Public Data Network
PDU	protocol data unit
PHY	physical [layer]
PMD	physical medium dependent
PT	payload type
PVC	permanent virtual circuit
RIP	Routing Information Protocol
SAAL	signaling AAL
SAP	service access point
SAR	segmentation and reassembly
SMDS	Switched Multimegabit Data Service
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol
SONET/SDH	Synchronous Optical Network/Synchronous Digital Hierarchy
SPE	synchronous payload envelope
SRM	System Resource Module
SSCOP	Service Specific Connection Oriented Protocol
SSCS	service specific convergence sublayer
SVC	switched virtual circuit
UNI	user-to-network interface
VC	virtual circuit
VCC	virtual channel connection
VCI	virtual channel identifier

VCL	virtual channel link
VPC	virtual path connection
VPI	virtual path identifier
WAN	wide area network

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Sydney, Australia	61-2-9927-8800
Tokyo, Japan	81-3-5402-7041

Chapter 1
Understanding MPOA and NHRP

This chapter describes the concepts underlying Multi-protocol over ATM (MPOA) and Next-Hop Resolution Protocol (NHRP) and, where appropriate, the specific ways in which Nortel Networks implements MPOA and NHRP functionality on its routers. It contains the following information:

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ATM General Information	1-1
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NHRP	1-7
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Where to Go Next	1-9

ATM General Information

Asynchronous transfer mode (ATM) is a connection-oriented, cell-based technology that relays traffic across a Broadband Integrated Services Digital Network (B-ISDN). ATM provides a cost-effective way of transmitting voice, video, and data across a network. For more information about ATM, see *Configuring ATM Services*.

Multi-Protocol over ATM

As defined by the ATM Forum, Multi-Protocol over ATM (MPOA) maps routed and bridged *traffic flows* to ATM SVCs, thereby removing many performance limitations imposed by the multihop routing of individual packets. This technique of mapping identifiable traffic flows to virtual channels creates network "shortcuts" between source and destination clients, and is generally referred to as *cut-through* or *zero-hop routing*. Figure 1-1 shows how users on LAN 1 or LAN 2 can communicate efficiently over an independent layer 2 (ATM) virtual channel, established by means of MPOA and NHRP negotiations.

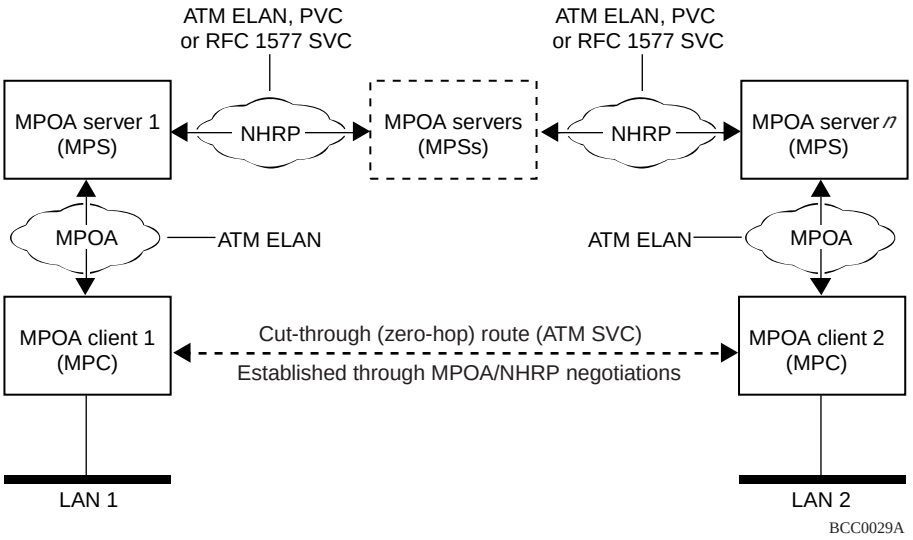

Figure 1-1. ATM Zero-Hop (Cut-Through) Routing

MPOA supports communication between an MPOA client (MPC), typically an ATM edge device or switch, and its MPOA server (MPS), typically a router. NHRP supports communication between MPSs.

Although the connection between any two MPSs can be supported by an ATM PVC, RFC 1577 SVC (ATM Classical IP), or emulated LAN (ATM LANE), the connection between any MPC and its MPS must always be supported by an ELAN, as shown in Figure 1-1 on page 1-2.

Cut-through routing is based on the fact that, in most cases, data transfer occurs at a steady rate of flow. For example, data or file transfer from one legacy Ethernet LAN to a remote counterpart usually involves multiple frames. A file transfer of approximately 45 KB requires about 30 Ethernet frames, all addressed to the same destination.

In an MPOA environment, it is possible to:

- Identify, from the address field in the first frame of a data/file transfer, the recipient of that data or file.
- Establish an SVC to the recipient.

The software then disassembles all 30 or so frames into approximately 900 ATM cells and transmitts them to the recipient by way of the virtual channel provided by the SVC.

Network performance improves as the cells follow a predetermined direct path, in contrast to the hop-by-hop routing of the Ethernet frames. Network performance improves markedly in the case of steady-stream deterministic data flows, such as video.

MPOA Logical Components

MPOA operations are based on logical components, which can be implemented in various configurations of hardware and software. MPOA logical components include the following:

- MPOA clients

  An MPOA client (MPC) resides in each ATM edge device (for example, an ATM switch) served by an MPOA router. BayRS does not provide MPC functionality. The primary function of the MPC is to act, in ATM terminology, as an *ingress* or *egress* point for traffic establishing and subsequently using network cut-throughs.

The MPC monitors traffic flows between a local source and remote destinations. When traffic volume between a source and a destination exceeds a preconfigured threshold level (for example *x* packets to the same network layer address in *y* seconds), the MPC attempts to set up an SVC between the source and destination workstations.

In attempting to set up an SVC, the MPC first looks in a local cache of network layer-to-ATM address mappings. If the MPC finds the destination address in its local cache, it immediately begins to establish the SVC. If it fails to locate the destination address in the local cache, it generates an MPOA address resolution request to an adjacent MPOA server.

- MPOA routers

  Each MPOA router that serves MPCs, directly or indirectly, includes a collection of logical functions that map network layer addresses to ATM addresses. Each MPOA router maintains tables of adjacent network layer (IP), MAC layer, and ATM addresses, in addition to standard routing tables derived from a routing protocol (generally OSPF or RIP).

  MPOA routers communicate over NHRP to map network layer addresses to ATM addresses. BayRS provides MPOA router functionality to map IP addresses to their ATM counterparts.

- MPOA servers

  The MPOA server (MPS) is a logical function that mediates between local MPCs and the MPOA router. It receives MPOA address resolution requests from MPCs and passes them to the MPOA routing function. The MPOA router, using NHRP, resolves the address and passes the requested ATM address back to the MPS. The MPS, in turn, forwards the resolved address to the requesting MPC. BayRS provides MPOA server functionality.

MPOA Basic Elements

MPOA services provided by each Nortel Networks router depend on the existence of:

- An ATM emulated LAN (using LANE) between each MPC and its MPS.
- An ATM emulated LAN, ATM Classical IP (RFC 1577 SVC), or an ATM PVC between any two MPSs. (See Figure 1-1 on page 1-2.)
- NHRP to resolve ATM and IP source and destination addresses.
- IP to route NHRP packets and other traffic between MPSs.

For more information about	Go to
IP	*Configuring IP Services*
LANE	*Configuring ATM Services*
NHRP	"NHRP" on page 1-7

Establishing a Network Cut-Through

MPOA components and elements function together to establish an SVC between a source host and a destination host, as follows:

1. A local MPC monitors traffic flow and maintains a count of packets addressed over a specific interval to remote hosts. When the count exceeds a threshold value, the MPC attempts to establish an SVC to the host.

   To establish the virtual connection, the MPC needs the ATM address of the host.

2. The MPC first checks a local address resolution cache to map the known network layer address with an ATM equivalent.

3. If the cache search fails, the MPC issues an MPOA resolution request to the local MPS function resident on the adjacent router.

4. The local MPS hands the resolution request to the MPOA router component.

5. The MPOA router generates an NHRP address resolution request for the ATM address of the destination host. Standard routing protocols move the NHRP request through the network toward the destination host. Eventually, the NHRP request reaches the egress router, that is, the router that serves the target host.

6. The egress router forwards the request to its MPS entity.

7. The remote MPS provides the ATM address of the destination host to its NHRP entity.

   If the destination host is connected to a legacy LAN, the MPS provides the ATM address of the router that connects to the legacy LAN. If the destination host is ATM-attached, the MPS provides the ATM address of the destination host.

8. The remote MPOA router generates an NHRP address resolution reply containing the ATM address provided by the MPS. Standard routing protocols move the NHRP reply through the network to the local MPOA router.
9. The local MPOA router sends the resolved address to the MPS, which then caches and sends the resolved address to the MPC that initiated the resolution process.
10. The local MPC caches the address resolution information and establishes an SVC to the remote MPC, establishing the network cut-through connection for more efficient communication.

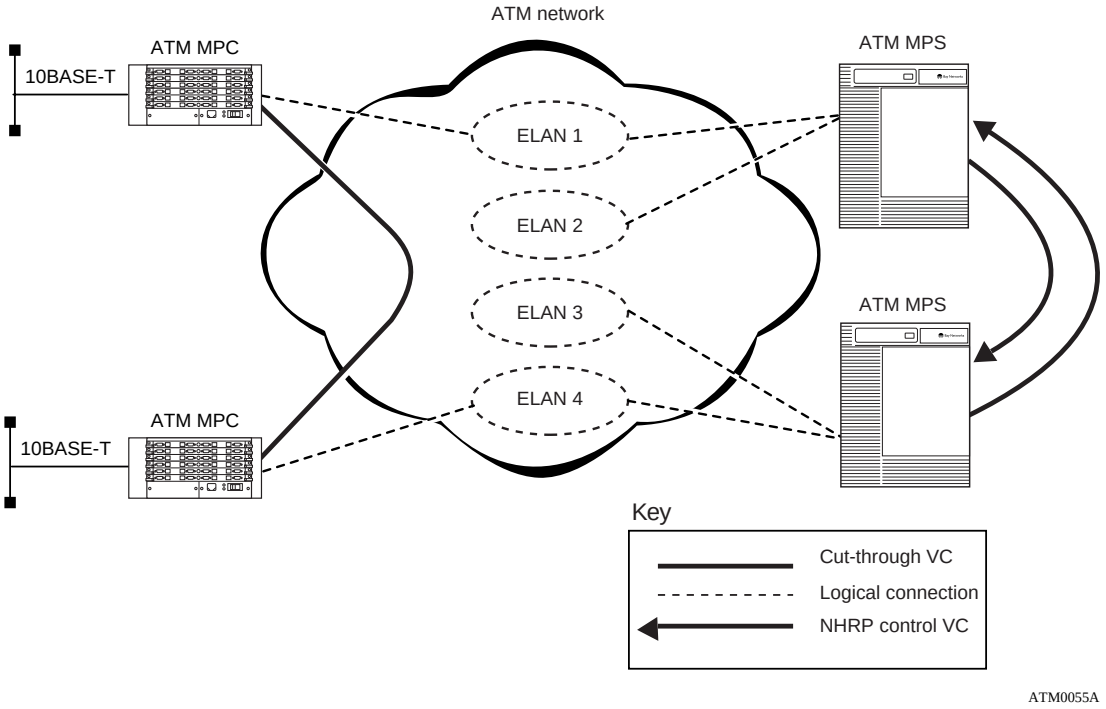

Figure 1-2. MPOA with Cut-Through VC

Note again that in Figure 1-2, the logical connection between any two MPSs can be an ATM PVC or RFC 1577 SVC (ATM Classical IP) instead of an ELAN, depending on your network topology requirements.

NHRP

NHRP is an address resolution protocol described in Internet RFC 2332. As defined by the RFC, NHRP provides address resolution services by mapping "internetworking layer addresses to NBMA subnetwork addresses." As implemented by Nortel Networks, NHRP resolves IP to ATM addresses.

The IETF draft specifies behavior for NHRP clients and NHRP servers.

- The NHRP client (NHC) generates NHRP address resolution requests on behalf of applications such as a local MPS.
- The NHRP server (NHS) responds to NHRP address resolution requests by generating NHRP address resolution replies. For this purpose, the NHS maintains a next-hop cache.

NHRP supports address resolution using seven formatted message types.

- NHRP resolution request

  An NHRP resolution request is generated by an NHC and routed through the ATM topology. Functionally equivalent to a standard ARP request, it contains the layer 3 and layer 2 address of the originator, the layer 3 address of the target destination, and a blank field reserved for the layer 2 address of the target. As implemented by Nortel Networks, the NHRP resolution request contains the IP and ATM addresses of the originator and the IP address of the target.

- NHRP resolution reply

  An NHRP resolution reply is generated by an NHS in response to an NHRP resolution request. Like an NHRP resolution request, it is routed through the ATM topology. It is functionally equivalent to a standard ARP response in that it replicates the information in the NHRP resolution request and supplies the requested layer 2 (ATM) address.

- NHRP registration request

  An NHRP registration request is generated by an NHC and directed toward the local NHS. The NHRP registration request is used to register address mapping data gathered by the NHC with the NHS. The NHS places mapping data in its next-hop cache.

- NHRP registration reply

  An NHRP registration reply is generated by an NHS in response to an NHRP registration request. It provides positive or negative acknowledgment of data receipt.

- NHRP purge request

  An NHRP purge request can be generated by either an NHC or an NHS. It requests the recipient to delete previously cached information that has become invalid.

- NHRP purge reply

  An NHRP purge reply is generated by either an NHC or an NHS in response to an NHRP purge request. It provides positive acknowledgment of data receipt.

- NHRP error indication

  An NHRP error indication can be generated by either an NHC or an NHS. It conveys error status to the sender of an NHRP message.

For More Information

For more information about MPOA and NHRP, refer to the following documents:

Heinanen, J. *Multiprotocol Encapsulation over ATM Adaptation Layer 5*. RFC 1483. Network Working Group. July 1993.

Cole, B., N. Doraswamy, D. Katz, J. Luciani, D. Piscitello. *NBMA Next Hop Resolution Protocol (NHRP)*. RFC 2332. April 1998.

Where to Go Next

Use the following table to determine where to go next.

If you want to	Go to
Learn about ATM and PVCs.	*Configuring ATM Services*
Learn about LAN emulation.	
Start MPOA and NHRP services.	Chapter 2
Change default settings for MPOA server parameters.	Chapter 3
Change default settings for NHRP client or server parameters.	Chapter 4
Obtain information about Site Manager parameters.	Appendix A
Obtain information about BCC parameters.	Appendix B
Monitor ATM using the BCC show commands.	Appendix C
Review an example MPOA/NHRP configuration sequence.	Appendix D
Review the BCC configuration tree for MPOA and NHRP services.	Appendix E

Chapter 2
Starting MPOA and NHRP Services

This chapter describes how to create basic MPOA and NHRP configurations by specifying values for required parameters only, and by accepting default values for all other parameters.

This chapter contains the following information:

Topic	Page
Starting Configuration Tools	2-1
Starting the MPOA Server	2-2
Starting NHRP on an ATM LEC, PVC, or Classical IP Service	2-5
Where to Go Next	2-16

Starting Configuration Tools

Before configuring MPOA or NHRP services, refer to the following user guides for instructions on how to start and use the Nortel Networks configuration tool of your choice.

Configuration Tool	User Guide
Bay Command Console (BCC)	*Using the Bay Command Console (BCC)*
Site Manager	*Configuring and Managing Routers with Site Manager*

Starting the MPOA Server

To start the MPOA server, you must perform the following steps:

1. Start ATM on the router. (See *Configuring ATM Services*.)
2. Configure any ATM PVCs, SVCs (Classical IP), and LAN emulation client (LEC) services that you need for MPOA/NHRP to operate within your specific network topology. (See Chapter 1 and *Configuring ATM Services.*)

   Be sure to:

   - Specify LANE data encapsulation for each LEC that you require.
   - Specify LLC-SNAP data encapsulation for each PVC that you require.
   - Configure IP and NHRP on each LEC, PVC, and Classical IP (SVC) service.
3. Create an MPOA service record.
4. Add an MPS to the MPOA service record.
5. Ensure that a LECS has been configured on your network.
6. Map any LEC services on the router to the desired local MPS.

Creating an MPOA Service Record

To run an MPOA server over ATM, you must first create an MPOA service record on an ATM interface. Then you add one or more MPOA servers (MPSs) to the MPOA service record.You can use the BCC or Site Manager to accomplish this using default values for all parameters.

Using the BCC

To create an MPOA service record, navigate to the appropriate ATM interface prompt and enter:

mpoa-service

For example, on a System 5000™ router, the following command sequence:

- Creates an ATM interface on slot 5, module 3, connector 1.
- Creates an MPOA service on the ATM interface.

```
stack# atm slot 5 module 3 connector 1
atm/5/3/1# signaling <-- (Signaling must be enabled for a new ATM interface.)
signaling/5/3/1# back
atm/5/3/1# mpoa-service
mpoa-service/5/3/1#
```

On a BLN®/BCN® router, the commands are identical, except that you do not specify a module number for the ATM interface:

```
box# atm slot 5 connector 1
atm/5/1# signaling
signaling/5/1# back
atm/5/1# mpoa-service
mpoa-service/5/1#
```

Using Site Manager

To create an MPOA service using Site Manager, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on an ATM link module interface (for example, **ATM1**).	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Server Parameters window opens.
4. Click on **OK**.	The MPOA Service Record window opens.
5. Go to the next section, "Adding an MPOA Server," or go to the next step to exit this procedure.	
6. Click on **Done**.	You return to the Edit ATM Connector window.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
7. Click on **Done**.	You return to the Select Connection Type window.
8. Click on **Done**.	You return to the Configuration Manager window.

By default, when you enter and then exit the MPOA Service Record window, you automatically create and enable the MPOA service record using the default settings. You need only enter and exit this window one time to create and enable the MPOA service record. However, for MPOA to operate, you must add at least one MPS to the service record.

Note: You can have only one MPOA service record per ATM interface. However, this service record can contain up to four MPSs.

Adding an MPOA Server

You must add at least one MPS to any MPOA service that you create on an ATM interface. Although not operational until fully configured, an MPS is enabled by default when you add it to an MPOA service record.

A new MPS must be in the enabled state so that you can map it to one or more LEC services. Then you can use either the BCC or Site Manager to map each MPS to a specific LEC service on the router.

Using the BCC

To add an MPS, navigate to the desired MPOA service prompt and enter:

mps mps-name *<mps-name>*

For example, on a System 5000 router, the following command adds an MPS named “eastcoast” to an MPOA service:

```
mpoa-service/5/3/1# mps mps-name eastcoast
mps/eastcoast#
```

Using Site Manager

To add an MPS to an MPOA service, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on an ATM link module interface (for example, **ATM1**).	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Server Parameters window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on **Add**.	The MPS Configuration Parameters window opens.
6. Click on **OK**.	You return to the MPS List window. The MPS List window shows the added MPS.
7. Repeat steps 5 and 6 to add additional MPOA servers.	
8. Go to the next section, "Starting NHRP on an ATM LEC, PVC, or Classical IP Service" or go to the next step to exit this procedure.	
9. Click on **Done**.	You return to the MPOA Service Record window.
10. Click on **Done**.	You return to the Edit ATM Connector window.
11. Click on **Done**.	You return to the Select Connection Type window.
12. Click on **Done**.	You return to the Configuration Manager window.

Starting NHRP on an ATM LEC, PVC, or Classical IP Service

Before configuring NHRP on a Nortel Networks router, determine the type of link between each pair of MPSs in your ATM network. After making this determination, configure IP, RIP or OSPF, and NHRP on the LEC, PVC, or Classical IP service (as determined for each MPS-to-MPS link).

Note: Enabling RIP or OSPF on an LEC, PVC, or Classical IP (SVC) service is unnecessary if your network already has a routed path between MPSs.

Based on each type of link between two MPSs, proceed as follows:

MPS Link	Service	Go to
Emulated LAN (ELAN)	LEC service	Starting NHRP on an ATM LEC Service
Permanent virtual circuit (PVC)	PVC service	Starting NHRP on an ATM PVC Service
Switched virtual circuit (SVC)	Classical IP service	Starting NHRP on an ATM Classical IP (RFC 1577 SVC) Service

Starting NHRP on an ATM LEC Service

To allow LANE and normally routed traffic to flow through an ATM LEC service and between MPSs, enable IP and optionally a routing protocol (RIP or OSPF) on that IP interface.

To allow NHRP address resolution requests and replies to flow through the same ATM LEC service and between MPSs, you must enable NHRP on that service.

You can use either the BCC or Site Manager to add IP, RIP or OSPF, and NHRP to an LEC service.

Using the BCC

To add IP, RIP or OSPF, and NHRP to an existing LEC service:

1. **Navigate to the appropriate lec-service prompt and enter:**

   nhrp

2. **Navigate back to the lec-service prompt, and enter:**

   ip address *<IP_address>* **mask** *<subnet_mask>*

3. **At the resulting IP interface prompt, add the desired routing protocol (RIP or OSPF):**

   rip

For example, on a System 5000 router, the following BCC commands navigate to the lec-service named “newyork” and add NHRP, IP, and RIP to that service:

```
stack# atm/5/3/1
atm/5/3/1# lec-service/newyork
lec-service/newyork# nhrp
nhrp/newyork# back
ip/1.2.3.4/255.0.0.0# rip
rip/1.2.3.4#
```

When you add NHRP to any ATM LEC service, the BCC automatically creates the global NHRP object at root level if you have not already done so.

Using Site Manager

To add NHRP to an existing LEC service, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) on which you want to add NHRP.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **Service Attributes**.	The ATM Service Records List window opens.
4. Click on the ATM LANE service record to which you want to add NHRP.	
5. Click on the Protocols menu in the upper left hand corner of the window.	
6. Choose **Add/Delete**.	The Select Protocols window opens.
7. Select **IP**, **RIP**, and **NHRP**.	
8. Click on **OK**.	The IP Configuration window opens.
9. Set the following parameters: • **IP Address** • **Subnet Mask** • **Transmit Bcast Address** Click on **Help** or see *Configuring IP, ARP, RIP, and OSPF Services* for parameter descriptions.	

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
10. Click on **OK**.	The NHRP Network Configuration window opens.
11. Set the following parameters, or use default values: • **NHRP Request Path *(View Only)*** • **Client Enable** • **Client Reg Interval** • **Client Hold Time** • **Client Request Timeout** • **Client Request Retry** • **Client Max Pending Request Entries** • **Server Enable** • **Server Forward Enable** • **Server Max Next Hop Entries** • **Server Max Pending Request Entries** Click on **Help** or see the parameter descriptions beginning on page A-14.	
12. Click on **OK.**	You return to the ATM Service Records List window which displays a summary of the NHRP record that you configured.
13. Click on **Done**.	You return to the Edit ATM Connector window.
14. Click on **Done**.	You return to the Select Connection Type window.
15. Click on **Done**.	You return to the Configuration Manager window.

Mapping an MPS to a LAN Emulation Client

You must map an MPS to any LEC service likely to send and receive MPOA resolution requests and replies over the ATM network. You can map one MPS to one or more LEC services configured on the same ATM slot and connector.

Using the BCC

To map an MPS to an LEC service, navigate to that LEC service and enter:

mpoa-server mps-name *<mps-name>*

For example, on a System 5000 router, the following BCC commands navigate to the LEC service “newyork” and map the MPS named “eastcoast” to it:

```
stack# atm/5/3/1
atm/5/3/1# lec-service/newyork
lec-service/newyork# mpoa-server mps-name eastcoast
mpoa-server/newyork#
```

Figure 2-1 shows the configuration hierarchy and logical mapping between the MPS and the LEC in this example.

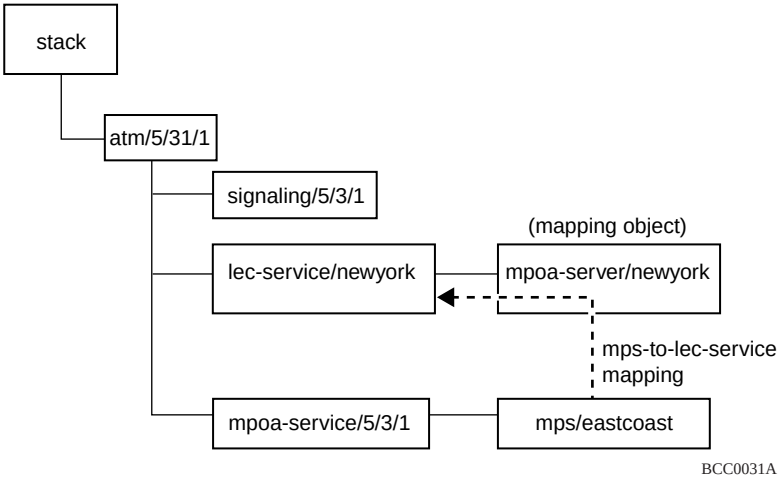

Figure 2-1. Mapping an MPS to an LEC Service

Using Site Manager

To map an MPOA server (MPS) to a LEC service, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on an ATM link module interface (for example, **ATM1**).	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on **Mapping**.	The LEC (to) MPS Mapping List window opens.
6. Click on any LEC that you want to map to the MPS.	
7. Click on **Mapping**.	Site Manager maps the LEC to the MPS.
8. Repeat steps 8 and 9 to map any additional LECs.	
9. Click on **Done**.	You return to the MPS List window.
10. Click on **Done**.	You return to the MPOA Service Record window.
11. Click on **Done**.	You return to the Edit ATM Connector window.
12. Click on **Done**.	You return to the Select Connection Type window.
13. Click on **Done**.	You return to the Configuration Manager window.

Starting NHRP on an ATM PVC Service

To allow normally routed traffic to flow through an ATM PVC service and between MPSs, enable IP plus an optional routing protocol (RIP or OSPF) on that IP interface. (Configure RIP or OSPF if no routed paths exist between MPSs in your ATM network).

To allow NHRP address resolution requests and replies to flow through the same ATM PVC service and between MPSs, you must enable NHRP on that service.

You can use either the BCC or Site Manager to add IP, RIP or OSPF, and NHRP to an ATM PVC service.

Using the BCC

To add IP, RIP or OSPF, and NHRP to an existing ATM PVC service:

1. **Navigate to the appropriate pvc-service prompt and enter:**

   nhrp

2. **Navigate back to the pvc-service prompt, and enter:**

   ip address *<IP_address>* **mask** *<subnet_mask>*

3. **At the resulting IP interface prompt, add a routing protocol (RIP or OSPF):**

   rip

For example, on a System 5000 router, the following BCC commands navigate to the pvc-service named “phoenix” and add NHRP, IP, and RIP:

```
stack# atm/5/3/1
atm/5/3/1# pvc-service servicename phoenix
pvc-service/phoenix# nhrp
nhrp/phoenix# back
ip/1.2.3.6/255.0.0.0# rip
rip/1.2.3.6#
```

When you add NHRP to any ATM PVC service, the BCC automatically creates the global NHRP object at root level if you have not already done so.

Using Site Manager

To add NHRP to an existing ATM interface, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) on which you want to add NHRP.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **Service Attributes**.	The ATM Service Records List window opens.
4. Click on the PVC service record to which you want to add NHRP.	
5. Click on the Protocols menu in the upper left corner of the window.	
6. Choose **Add/Delete**.	The Select Protocols window opens.
7. Select **IP**, **RIP**, and **NHRP**.	
8. Click on **OK**.	The IP Configuration window opens.
9. Set the following parameters: • **IP Address** • **Subnet Mask** • **Transmit Bcast Address** Click on **Help** or see *Configuring IP, ARP, RIP, and OSPF Services* for parameter descriptions.	
10. Click on **OK**.	The NHRP Network Configuration (NHRP global parameters) window opens if NHRP has not been configured on any interface.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
11. Use default values for the following parameters: • **NHRP Request Path** • **Client Enable** • **Client Reg Interval** • **Client Hold Time** • **Client Request Timeout** • **Client Request Retry** • **Client Max Pending Request Entries** • **Server Enable** • **Server Forward Enable** • **Server Max Next Hop Entries** • **Server Max Pending Request Entries** Click on **Help** or see the parameter descriptions beginning on page A-14.	
12. Click on **OK.**	You return to the ATM Service Records List window which displays a summary of the NHRP record that you configured.
13. Click on **Done**.	You return to the Edit ATM Connector window.
14. Click on **Done**.	You return to the Select Connection Type window.
15. Click on **Done**.	You return to the Configuration Manager window.

Starting NHRP on an ATM Classical IP (RFC 1577 SVC) Service

To allow normally routed traffic to flow through an ATM SVC (Classical IP) service and between MPSs, enable IP plus an optional routing protocol on that IP interface. (Configure RIP or OSPF if no routed path exists between MPSs in your ATM network).

To allow NHRP address resolution requests and replies to flow through the same ATM Classical IP (SVC) service and between MPSs, you must enable NHRP on that service.

You can use either the BCC or Site Manager to add IP, RIP or OSPF, and NHRP to the appropriate ATM Classical IP (SVC) service.

When configuring an RFC 1577 SVC connection between a pair of MPSs, keep the following in mind:

- The SVCs must use LLC/SNAP encapsulation (you cannot use NLPID or NULL encapsulation on the SVC).
- You must configure the SVC with IP and NHRP.
- To avoid manually configuring adjacent hosts for each MPS, you may want to configure the SVC to run RIP.
- Set the client mode for the SVC to client on one MPS and server on the other MPS.

For instructions on configuring an SVC service record with LLC/SNAP encapsulation, see *Configuring ATM Services*.

Using the BCC

To add IP, RIP or OSPF, and NHRP to an existing ATM Classical IP (RFC 1577 SVC) service:

1. **Navigate to the desired classical-ip-service prompt and enter:**

   nhrp

2. **Navigate back to the classical-ip-service prompt, and enter:**

   ip address *<IP_address>* **mask** *<subnet_mask>*

3. **At the resulting IP interface prompt, add the desired routing protocol (RIP or OSPF):**

   rip

For example, on a System 5000 router, the following BCC commands navigate to the classical-ip-service named “baltimore” and add IP, RIP, and NHRP to that service:

```
stack# atm/5/3/1
atm/5/3/1# classical-ip-service servicename baltimore
classical-ip-service/baltimore# nhrp
nhrp/baltimore# back
ip/1.2.3.6/255.0.0.0# rip
rip/1.2.3.6#
```

When you add NHRP to any ATM Classical IP service, the BCC automatically creates the global NHRP object at root level if you have not already done so.

Using Site Manager

After you create an ATM SVC service record, the Add Protocols window opens. To add IP, NHRP, and RIP to an SVC service record, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. Click on **IP**.	A check mark appears in the IP box.
2. Click on **RIP**.	A check mark appears in the RIP box
3. Click on **NHRP**.	A check mark appears in the NHRP box.
4. Click on **OK**.	The IP Configuration window opens.
5. Set the following parameters: • **IP Address** • **Subnet Mask** • **Transmit Bcast Address** Click on **Help** or see *Configuring IP, ARP, RIP, and OSPF Services* for parameter descriptions.	
6. Click on **OK**.	The ATM ARP Configuration window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
7. Set the following parameters: • **ATM ARP Mode** • **ARP Server ATM Address Network Prefix** • **ARP Server ATM Address User Part** Click on **Help** or see the parameter descriptions in *Configuring ATM Services*.	
8. Click on **OK**.	The NHRP Network Configuration window opens.
9. Click on **OK**.	You return to the ATM Service Records List window.
10. Click on **Done**.	You return to the Edit ATM Connector window.
11. Click on **Done**.	You return to the Select Connection Type window.
12. Click on **Done**.	You return to the Configuration Manager window.

Where to Go Next

Use the following table to determine where to go next.

If you want to	**Go to**
Obtain an overview of MPOA and NHRP operation.	Chapter 1
Change default settings for MPOA server parameters.	Chapter 3
Change default settings for NHRP client or server parameters.	Chapter 4
Obtain information about Site Manager parameters.	Appendix A
Obtain information about BCC parameters	Appendix B
Monitor ATM using the BCC show commands.	Appendix C
Review an example MPOA and NHRP configuration process.	Appendix D
Review the BCC configuration tree for MPOA and NHRP services.	Appendix E

Chapter 3
Customizing MPOA Services

Bay Networks supports Multi-Protocol over ATM (MPOA) server configuration. MPOA is the ATM Forum standard that specifies a way to efficiently transport intersubnet, unicast data in a LANE environment. For general information about the Bay Networks implementation of MPOA, see “Multi-Protocol over ATM” on page 1-2.

This chapter describes how to customize an MPOA server configuration and includes the following information:

Topic	Page
Disabling and Reenabling an MPOA Service	3-2
Setting the MPS Address Generating Mode	3-3
Specifying an MPS Control ATM Address	3-5
Disabling and Reenabling MPOA Servers	3-8
Specifying the MPS Configuration Mode	3-10
Specifying a LECS ATM Address	3-11
Configuring a Unique Selector Byte for an MPS Address	3-14
Defining MPS Timer Values	3-16
Defining MPS Cache Values	3-25
Deleting MPOA Servers	3-28
Deleting an MPOA Service Record	3-29
Where to Go Next	3-31

You must create an MPOA service record before you can customize an MPS. For information about creating an MPOA service record and starting the MPOA server, see “Starting the MPOA Server” on page 2-2.

Disabling and Reenabling an MPOA Service

The MPOA service on an ATM interface is normally enabled, which allows MPOA servers (MPSs) configured on that service to operate normally. If you need to functionally disable all MPSs configured on a service simultaneously, disable the underlying MPOA service. You can do this using either the BCC or Site Manager.

Using the BCC

To disable an MPOA Service, navigate to that service and enter:

state disabled

or:

To reenable an MPOA Service, navigate to that service and enter:

state enabled

For example, on a System 5000 router, the following commands:

- Navigate from root (`stack#`) level to the MPOA service on existing interface atm/5/3/1. (Assume that ATM signalling was enabled earlier with atm/5/3/1.)
- Disable the MPOA service, functionally disabling all MPSs configured on atm/5/3/1.
- Reenable the same MPOA service, functionally reenabling all MPSs configured on atm/5/3/1.

```
stack# atm slot 5 module 3 connector 1
atm/5/3/1# mpoa-service
mpoa-service/5/3/1# state disabled
mpoa-service/5/3/1# state enabled
mpoa-service/5/3/1#
```

Using Site Manager

To disable or reenable the MPOA service record, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-3.	
5. Click on **Done**.	You return to the Edit ATM Connector window.
6. Click on **Done**.	You return to the Select Connection Type window.
7. Click on **Done**.	You return to the Configuration Manager window.

Setting the MPS Address Generating Mode

By default, a newly created MPS automatically uses the 13-byte ATM address domain that it receives from the network switch. In this default mode (automatic address generation), the MPS also uses the MAC address of the underlying ATM interface as the basis for the 7-byte user suffix of the MPS address.

You can alternatively configure a new MPS with an ATM address that *you* provide in the MPOA service record. Whether derived automatically by MPOA or manually from the MPOA service record, the address assigned to each MPS is its *control ATM address.*

You can use the BCC or Site Manager to change the MPS address generation mode from automatic to manual.

Using the BCC

To set the MPS address generating mode, navigate to the appropriate ATM mpoa-service and enter the following command:

autogenerate { **enabled** | **disabled** }

With this mode enabled, the MPS automatically generates an ATM address based on information it receives from an LECS. If you disable this mode, the MPS uses an ATM address based on the value you configured for the network-prefix and user-suffix parameters of the MPOA service record. (If you disable address autogeneration, be sure to configure values for network-prefix and user-suffix.)

For example, on a System 5000 router, the following commands:

- Navigate to the mpoa-service on ATM interface atm/5/3/1 on a System 5000 router.
- Disable ATM address autogeneration.

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# autogenerate disabled
```

Using Site Manager

To set the MPS address generating mode, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Set the **MPS Address Generate Mode** parameter. Click on **Help** or see the parameter description on page A-3.	

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Click on **Done**.	You return to the Edit ATM Connector window.
6. Click on **Done**.	You return to the Select Connection Type window.
7. Click on **Done**.	You return to the Configuration Manager window.

Note: The MPS Address Generate Mode parameter also appears in the MPS List window and the MPS Configuration Parameters window for display purposes only. You must configure this parameter at the Site Manager MPOA service record level.

Specifying an MPS Control ATM Address

By default, an MPS automatically inherits its:

- ATM address domain (network prefix) from the network switch
- ATM end-station identifier (6 bytes of the user suffix) from the MAC address of the underlying ATM interface
- ATM selector byte value (the least-significant or last byte of the user suffix) from the highest selector byte value currently configured, incremented by 1 to ensure uniqueness.

However, if you configure the MPOA service to ignore this information, you must manually specify the ATM network prefix and user suffix that you want MPS to use in its ATM address. These two elements together define the full MPS control ATM address.

Network Prefix

The control ATM address network prefix specifies the ATM domain of the MPS. This 13-byte portion of the ATM address can have values ranging from *XX*0000000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFFFFF.

For user-configured network prefix values, the *XX* byte must contain 39, 45, or 47. These values define the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format the prefix uses. For more information about the AFI byte, refer to the ATM Forum UNI specification.

Entering an ATM address network prefix is optional. If you do not enter a network prefix in the specified range, the MPS accepts the first prefix value that it receives from the local switch.

Note: Each MPS obtains its ATM network prefix from the network prefix assigned to the MPOA service record. This means that all MPSs that you add to an MPOA service record will have the same ATM network prefix.

User Suffix

The control ATM address user part consists of a 6-byte end-station identifier and a 1-byte selector field. This 7-byte portion of the ATM address can have values ranging from 00000000000000 to FEFFFFFFFFFFFF.

With ATM address generation in manual mode (autogeneration disabled), you can use the BCC or Site Manager to manually configure a network prefix and user suffix for the control ATM address.

Using the BCC

To configure a value for the network prefix in the MPS control ATM address:

1. **Navigate to the appropriate mpoa-service prompt and ensure that the autogenerate parameter has a value of disabled, for example:**

   ```
   mpoa-service/5/3/1# autogenerate
     autogenerate disabled
   ```

2. **Configure a value for the network-prefix portion of the MPS control ATM address by entering:**

   network-prefix *<13_byte_octet_string>*

3. **Configure a value for the user-suffix portion of the MPS control ATM address by entering:**

   user-suffix *<7_byte_octet_string>*

For example, on a System 5000 router, the following commands:

- Navigate to the MPOA service on atm/5/3/1.
- Check to ensure that ATM address generation is in manual mode.
- Set a control ATM address network prefix and user suffix.

```
mpoa-service/5/3/1# autogenerate
  autogenerate disabled
mpoa-service/5/3/1# network-prefix 39aabbccddeeffaabbccddeeff
mpoa-service/5/3/1# user-suffix abcdefabcdefab
mpoa-service/5/3/1#
```

Using Site Manager

This procedure assumes that the MPS Address Generate Mode parameter in the MPOA Server Attributes window has been set to *manual*.

Now specify the control ATM address network prefix by completing the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Set the **Ctrl ATM Addr Network Prefix** and **Ctrl ATM Addr User Part** parameters. Click on **Help** or see the parameter descriptions on page A-4.	
5. Click on **Done**.	You return to the Edit ATM Connector window.
6. Click on **Done**.	You return to the Select Connection Type window.
7. Click on **Done**.	You return to the Configuration Manager window.

Disabling and Reenabling MPOA Servers

When you finish mapping an MPS to one or more LECs on the same slot, you can use either the BCC or Site Manager to disable and subsequently reenable that MPS for troubleshooting or other reasons.

Using the BCC

To disable a single MPS, navigate to the MPS you want to disable and enter:

state disabled

To reenable a disabled MPS, navigate to the MPS that you want to reenable and enter:

state enabled

For example, on a System 5000 router, the following commands navigate to, disable, and then reenable the MPS on mpoa-service/5/3/1:

Disabling:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/newyork
mps/newyork# state disabled
```

Reenabling:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/newyork
mps/newyork# state enabled
```

To disable or reenable multiple MPSs simultaneously, navigate to the MPOA service on which the MPSs exist and enter:

disable mps/*<mpsname>* ...

or:

enable mps/*<mpsname>* ...

For example, on a System 5000 router, the following BCC commands navigate to and disable two MPSs on mpoa-service/5/3/1:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# disable mps/newyork mps/chicago
mpoa-service/5/3/1#
```

Using Site Manager

To disable or reenable MPSs already mapped to LEC services, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-7.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Specifying the MPS Configuration Mode

The MPS configuration mode determines whether the MPS obtains configuration parameter values (for example, timer settings) automatically from the LAN emulation configuration server (LECS) or from the manual settings that you provide. Once you determine the source from which the router must obtain MPS configuration parameter values, set the MPS configuration mode to either automatic or manual, accordingly.

In manual mode, you either accept the router's MPS default timer values or change those values to suit your requirements (see "Defining MPS Timer Values" on page 3-16).

You can specify the MPS configuration mode using either the BCC or Site Manager.

Using the BCC

To specify the configuration mode used by each MPS, navigate to the appropriate MPS and enter:

config-mode {**automatic** | **manual**}

For example, on a System 5000 router, the following commands navigate to mps/newyork on interface atm/5/3/1 and change the MPS configuration mode from its default value (automatic) to its alternate value (manual):

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/newyork
mps/newyork# config-mode manual
```

Using Site Manager

To change the MPS configuration mode, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **MPS Config Mode** parameter. Click on **Help** or see the parameter description on page A-9.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Specifying a LECS ATM Address

You can use either the BCC or Site Manager to specify which LECS you want the MPS to use when obtaining parameter information. Entering this ATM address is optional; if you do not enter an address, the MPS automatically uses the well-known LECS ATM address to open a configuration VCC.

To manually specify the LECS ATM address for an MPS, you must set the following address elements:

- LECS ATM address network prefix
- LECS ATM address user suffix

These two elements together define the full ATM address of the LECS.

Note: The combined network prefix and user suffix must match the address of the LECS for the network.

Network Prefix

The LECS ATM address network prefix specifies the ATM domain of the MPS. This 13-byte portion of the ATM address can range from *XX*0000000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFFFFF.

The *XX* byte typically contains 39, 45, or 47. These values define the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format that the prefix uses. For more information about the AFI byte, refer to the ATM Forum UNI specification.

User Suffix

The LEC ATM address user suffix typically contains a 6-byte end-station identifier and a 1-byte selector field. This 7-byte portion of the ATM address can range from 00000000000000 to FEFFFFFFFFFFFF.

Using the BCC

Using the BCC, you can specify both parts of the address as the value for one parameter (lecs-address).

To specify a LECS ATM address for the MPS, navigate to the appropriate MPS prompt and enter:

lecs-address *<20_byte_octet_string>*

For example, on a System 5000 router, the following BCC commands navigate to mps/eastcoast and specify the 20-byte ATM address of the LECS that server should use.

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# lecs-address 45aabbccddeeff9988776655443311aabbccddff
mps/eastcoast#
```

Using Site Manager

Using Site Manager, you specify the network prefix and the user suffix as the values for two separate parameters.

To specify a LECS ATM address, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **LECS ATM Address** parameter. Click on **Help** or see the parameter descriptions for the **LECS ATM Addr Network Prefix** and **LECS ATM Address User Part** parameters on page A-6.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Note: When you initially add a LECS ATM address, you do so by configuring a separate ATM network prefix and ATM user part. However, when you modify an existing LECS ATM address, you need only change one parameter that contains both the ATM network prefix and the ATM user part suffix portion of the LECS address.

Configuring a Unique Selector Byte for an MPS Address

If you disable ATM address autogeneration, a newly created MPS uses the control ATM address user suffix that you configured in the MPOA service record. However, to ensure uniqueness among all ATM addresses used on the router, you must additionally specify a unique value for the 1-byte selector field of the MPS ATM address.

You can determine the user suffix values for MPSs currently configured on the router by entering the following command at any BCC prompt:

show mpoa server

Based on the output of this command, assign to each new MPS a selector byte value that is unique among selector byte values used for any other ATM addresses configured on the router. For example, if the highest user suffix used by any MPOA servers configured on the router is 0011223344556677 (selector byte value = 77), you could assign the next available user suffix value, 0011223344556678 (selector byte value = 78).

You can set a unique selector byte value using either the BCC or Site Manager.

Using the BCC

To customize the selector byte of the control ATM address value inherited by the MPS, navigate to the desired MPS and enter:

control-atm-address *<20_byte_octet_string>*

For example, on a System 5000 router, the following commands:

- Navigate to the MPOA service on atm/5/3/1.
- Navigate to mps/newyork and reenter the full control ATM address (from the MPOA service level) as the value for the MPS control-atm-address parameter, but with a unique value for the selector byte.

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/newyork
mps/newyork# control-atm-address 45112233445566778899AABBCC11223344556678
mps/newyork#
```

Using Site Manager

This procedure assumes that the MPS Address Generate Mode parameter in the MPOA Server Attributes window has been set to *manual*.

To specify the MPS control ATM address selector byte, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on **Add**.	The MPS Configuration Parameters window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
6. Set the **MPS Ctrl ATM Address Selector Byte** parameter. Click on **Help** or see the parameter description on page A-7.	
7. Click on **Done**.	You return to the MPS List window.
8. Click on **Done**.	You return to the MPOA Service Record window.
9. Click on **Done**.	You return to the Edit ATM Connector window.
10. Click on **Done**.	You return to the Select Connection Type window.
11. Click on **Done**.	You return to the Configuration Manager window.

Defining MPS Timer Values

Setting the *MPS configuration mode* to manual allows you to customize values for the following MPS timers:

- Keepalive time
- Keepalive lifetime
- Initial retry time
- Maximum retry time
- Give up time
- Default holding time

Setting the Transmission Interval for MPOA Keepalive Packets

The keepalive time specifies how often the MPS must transmit MPOA keepalive packets. By default, the value is 10 seconds. However, you can set the keepalive time to any value from 1 to 300 seconds using either the BCC or Site Manager.

Using the BCC

To set the keepalive time, navigate to the desired MPS and enter:

keep-alive-time *<1-300>*

For example, on a System 5000 router, the following BCC commands navigate from root level to mps/eastcoast and set the MPS keepalive time to 100 seconds:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# keep-alive-time 100
mps/eastcoast#
```

Using Site Manager

To set the keepalive time, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Keep Alive Time** parameter. Click on **Help** or see the parameter description on page A-12.	
7. Click on **Done**.	You return to the MPOA Service Record window.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Setting the Valid Lifetime for Keepalive Packets

The keepalive lifetime is the length of time that an MPOA client (MPC) considers valid a keepalive packet sent by its MPS. (The packet contains its keepalive value.) By default, the keepalive lifetime is 35 seconds. However, you can set this value from 3 to 1000 seconds using either the BCC or Site Manager.

Using the BCC

To set the keepalive lifetime, navigate to the desired MPS and enter:

keep-alive-lifetime *<3-1000>*

For example, on a System 5000 router, the following BCC commands navigate from root level to mps/eastcoast and set the MPS keepalive lifetime to 500 seconds:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# keep-alive-lifetime 500
mps/eastcoast#
```

Using Site Manager

To set the keepalive lifetime, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Keep Alive Life Time** parameter. Click on **Help** or see the parameter description on page A-12.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Setting the Initial Retry Time

The initial retry time is used by the MPOA retry mechanism. By default, the value is 5 seconds. However, you can set this value from 1 to 300 seconds using either the BCC or Site Manager.

Using the BCC

To set the initial retry time, navigate to the appropriate MPS and enter:

initial-retry-time *<1-300>*

For example, on a System 5000 router, the following commands navigate from root level to mps/eastcoast and set the MPS initial retry time to 50 seconds:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# initial-retry-time 50
mps/eastcoast#
```

Using Site Manager

To set the initial retry time, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Initial Retry Time** parameter. Click on **Help** or see the parameter description on page A-11.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Setting the Maximum Retry Time

The maximum retry time is used by the MPOA retry mechanism. By default, the value is 40 seconds. However, you can set this value from 10 to 300 seconds using either the BCC or Site Manager.

Using the BCC

To set the maximum retry time, navigate to the desired MPS and enter:

retry-time-maximum *<10-300>*

For example, on a System 5000 router, the following commands navigate from root level to mps/eastcoast and set the MPS maximum retry time to 200 seconds:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# retry-time-maximum 200
mps/eastcoast#
```

Using Site Manager

To set the maximum retry time, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Maximum Retry Time** parameter. Click on **Help** or see the parameter description on page A-13.	
7. Click on **Done**.	You return to the MPOA Service Record window.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Setting the Time to Wait for Responses to Resolution Requests

The give-up time is the minimum amount of time that the MPS must wait before giving up on a pending resolution request. By default, the value is 40 seconds. However, you can set this value from 5 to 300 seconds using either the BCC or Site Manager.

Using the BCC

To set the give-up time, navigate to the desired MPS and enter:

give-up-time *<5-300>*

For example, on a System 5000 router, the following BCC commands navigate from root level to mps/eastcoast and set the MPS give-up time to 175 seconds:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# give-up-time 175
mps/eastcoast#
```

Using Site Manager

To set the give-up time, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Give Up Time** parameter. Click on **Help** or see the parameter description on page A-10.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Setting the Valid Interval for Replies to Resolution Requests

The default holding time determines how long the client considers resolution replies held in the local cache as valid. By default, the value is 20 minutes. However, you can set this value from 1 to 120 minutes using either the BCC or Site Manager.

Using the BCC

To set the default holding time, navigate to the desired MPS and enter:

default-holding-time *<1-120>*

For example, on a System 5000 router, the following BCC commands navigate from root level to mps/eastcoast and set the MPS default holding time to 90 minutes:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# default-holding-time 90
mps/eastcoast#
```

Using Site Manager

To set the default holding time, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Default Holding Time** parameter. Click on **Help** or see the parameter description on page A-10.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Defining MPS Cache Values

The MPS can contain cache information upon initialization and can accumulate this information during its operation. Bay Networks provides control over this cache information.

Caution: The values you set for cache parameters affect router memory resources. Use caution when setting higher values.

Setting the Initial Cache Size

The initial cache size specifies the maximum number of cache units that the MPS can keep upon initialization. By default, the MPS can have a maximum initial cache size of 100 units. (Its actual initial size is typically zero.) You can use either the BCC or Site Manager to set the maximum initial cache size to any value from 50 to 500 units.

Using the BCC

To set the initial cache size, navigate to the appropriate MPS and enter:

initial-cache-size *<50-500>*

For example, on a System 5000 router, the following BCC commands navigate from root level to mps/eastcoast and set the MPS initial cache size to 150 units:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# initial-cache-size 150
mps/eastcoast#
```

Using Site Manager

To set the initial cache size, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Initial Cache Size** parameter. Click on **Help** or see the parameter description on page A-11.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Setting the Maximum Cache Size

The maximum cache size specifies the maximum number of cache units that the MPS can store at any time. By default, the MPS can have a maximum cache size of 500 units. However, you can use either the BCC or Site Manager to set the maximum cache size to any value from 100 to 2000 units.

Using the BCC

To set the maximum cache size, navigate to the appropriate MPS and enter:

maximum-cache-size *<100-2000>*

For example, on a System 5000 router, the following BCC commands navigate from root level to mps/eastcoast and set the MPS maximum cache size to 300 units:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/eastcoast
mps/eastcoast# maximum-cache-size 300
mps/eastcoast#
```

Using Site Manager

To set the maximum cache size, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to modify.	
6. Set the **Maximum Cache Size** parameter. Click on **Help** or see the parameter description on page A-13.	
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Deleting MPOA Servers

You can use either the BCC or Site Manager to delete one or more MPSs from an MPOA service record.

Using the BCC

To delete a single MPS, navigate to the MPS that you want to delete and enter:

delete

For example, on a System 5000 router, the following commands navigate to and delete the MPS on mpoa-service/5/3/1:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# mps/newyork
mps/newyork# delete
mpoa-service/5/3/1#
```

If you want to delete multiple MPSs simultaneously, navigate to the MPOA service on which the MPSs exist, and enter:

delete mps/*<mpsname>* ...

For example, on a System 5000 router, the following commands navigate to and delete two MPSs on mpoa-service/5/3/1:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# delete mps/newyork mps/chicago
mpoa-service/5/3/1#
```

Using Site Manager

To delete an individual MPS, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **MPS**.	The MPS List window opens.
5. Click on the MPS that you want to delete.	
6. Click on **Delete**.	Site Manager deletes the MPS.
7. Click on **Done**.	You return to the MPOA Service Record window.
8. Click on **Done**.	You return to the Edit ATM Connector window.
9. Click on **Done**.	You return to the Select Connection Type window.
10. Click on **Done**.	You return to the Configuration Manager window.

Deleting an MPOA Service Record

You can delete MPOA services from an ATM interface completely using either the BCC or Site Manager.

Using the BCC

Navigate to the MPOA service you want to delete and enter:

delete

For example, on a System 5000 router, the following commands navigate to and delete the MPOA service on interface atm/5/3/1:

```
stack# atm/5/3/1
atm/5/3/1# mpoa-service/5/3/1
mpoa-service/5/3/1# delete
atm/5/3/1#
```

Using Site Manager

To delete MPOA from the interface entirely, you must delete the MPOA service record. To delete the MPOA service record, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the ATM interface (**ATM1**) that you want to modify.	The Select Connection Type window opens.
2. Click on **ATM**.	The Edit ATM Connector window opens.
3. Click on **MPOA Server Attributes**.	The MPOA Service Record window opens.
4. Click on **Delete**.	Site Manager asks whether you really want to delete MPOA from this interface.
5. Click on **Yes**.	Site Manager deletes the service record.
6. Click on **Done**.	You return to the Edit ATM Connector window.
7. Click on **Done**.	You return to the Select Connection Type window.
8. Click on **Done**.	You return to the Configuration Manager window.

Where to Go Next

Use the following table to determine where to go next.

If you want to	Go to
Learn about ATM concepts.	*Configuring ATM Services*
Learn about MPOA and NHRP concepts.	Chapter 1
Change default settings for NHRP client or server parameters.	Chapter 4
Obtain information about Site Manager MPOA and NHRP parameters.	Appendix A
Obtain information about BCC MPOA and NHRP parameters.	Appendix B
Monitor MPOA and NHRP using the BCC show commands.	Appendix C
Review a BCC MPOA/NHRP example configuration sequence.	Appendix D
Review the BCC MPOA/NHRP configuration tree.	Appendix E

Chapter 4
Customizing NHRP Services

This chapter includes the following information:

Accessing NHRP Client and Server Global Parameters	4-2
Disabling NHRP on an LEC or PVC or Classical IP Service	4-4
Deleting NHRP from an LEC or PVC or SVC Service	4-6
Deleting NHRP Globally	4-7
Where to Go Next	4-8

Note: We recommend that you start and maintain NHRP with all default settings on the router. However, if you need to customize NHRP parameter values, you can use either the BCC or Site Manager to accomplish that task.

The BCC and Site Manager allow you to edit values for the following NHRP parameters:

BCC Parameter	Equivalent Site Manager Parameter
client	Client Enable
client-registration-interval	Client Reg Interval
client-hold-time	Client Hold Time
client-request-timeout	Client Request Timeout
client-request-retry	Client Request Retry
client-requests-maximum	Client Max Pending Request Entries
server	Server Enable
server-forwarding	Server Forward Enable
server-next-hop-maximum	Server Max Next Hop Entries
server-requests-maximum	Server Max Pending Request Entries
next-hop-cache-size	Max Next Hop Cache Size

The BCC and Site Manager also allow you to modify the configured state of NHRP on a PVC or LEC service. (See "“Disabling NHRP on an LEC or PVC or Classical IP Service” on page 4-4.")

Accessing NHRP Client and Server Global Parameters

You can customize the configurable global parameters of NHRP, using either the BCC or Site Manager.

Using the BCC

To access NHRP client and server parameters from root level (`box#` or `stack#`), enter:

nhrp

Once you enter the NHRP context, enter the **info** command to see which parameters you can modify using the BCC and what are their current (default) values.

For example, the following BCC commands:

- Navigate to global NHRP.
- List NHRP client and server parameters that you can modify.

```
stack# nhrp
nhrp/atm/ip# info
  client enabled
  client-registration-interval 25
  client-hold-time 30
  client-request-timeout 10
  client-request-retry 3
  client-requests-maximum 100
  server enabled
  server-forwarding enabled
  server-next-hop-maximum 5
  server-requests-maximum 100
  next-hop-cache-size 16
```

Read about these NHRP parameters in Appendix B. To modify any configurable NHRP client or server parameter, enter:

<parameter_name> <value>

For example, to change the value for the client-registration-interval to 35 seconds, and the server-next-hop-maximum to 6 entries, enter the following commands:

```
nhrp/atm/ip# client-registration-interval 35
nhrp/atm/ip# server-next-hop-maximum 6
```

Using Site Manager

To edit an NHRP record, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NHRP**.	The NHRP menu opens.
4. Choose **NhrpNetTable**.	The NHRP NetEntry List window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Click on the NHRP entry that you want to edit.	Site Manager displays the current NHRP entry-specific parameters.
6. Edit the following parameters as required: • **NHRP Request Path** • **Client Enable** • **Client Reg Interval** • **Client Hold Time** • **Client Request Timeout** • **Client Request Retry** • **Client Max Pending Request Entries** • **Server Enable** • **Server Forward Enable** • **Server Max Next Hop Entries** • **Server Max Pending Request Entries** Click on **Help** or see the parameter descriptions beginning on page A-14.	
7. Click on **Done**.	You return to the Configuration Manager window.

Disabling NHRP on an LEC or PVC or Classical IP Service

You can use either the BCC or Site Manager to disable NHRP on an LEC, PVC, or SVC (ATM Classical IP) service.

Note: You cannot disable NHRP globally (across all ATM slots) on the router. You can disable NHRP only on an individual LEC, PVC, or Classical IP (SVC) service.

Using the BCC

To disable NHRP on an LEC, PVC, or SVC (ATM Classical IP) service, navigate to NHRP on the appropriate service and enter:

disable

For example, on a System 5000 router, the following BCC commands navigate to the LEC service on atm/5/3/1 and disable NHRP on that service:

```
stack# atm/5/3/1
atm/5/3/1# lec-service/newyork
lec-service/newyork# nhrp
nhrp/newyork# disable
```

Using Site Manager

To disable an NHRP interface, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NHRP**.	The NHRP menu opens.
4. Choose **Interfaces**.	The NHRP Interface List window opens.
5. Click on the NHRP interface that you want to disable.	
6. Set the **Enable** parameter to **Disable**. Click on **Help** or see the parameter description on page A-14.	
7. Click on **Done**.	You return to the Configuration Manager window.

Deleting NHRP from an LEC or PVC or SVC Service

You can use either the BCC or Site Manager to delete NHRP from an LEC, PVC, or SVC (ATM Classical IP) service.

Using the BCC

To delete NHRP from an LEC, PVC, or SVC (ATM Classical IP) service, navigate to the appropriate service and enter:

delete

For example, on a System 5000 router, the following BCC commands navigate to the LEC service on atm/5/3/1 and delete NHRP from that service:

```
stack# atm/5/3/1
atm/5/3/1# lec-service/newyork
lec-service/newyork# nhrp
nhrp/newyork# delete
lec-service/newyork#
```

Using Site Manager

To delete an NHRP interface, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NHRP**.	The NHRP menu opens.
4. Choose **Interfaces**.	The NHRP Interface List window opens.
5. Click on the NHRP interface that you want to delete.	
6. Click on **Delete**.	Site Manager deletes the NHRP interface you selected.
7. Click on **Done**.	You return to the Configuration Manager window.

Deleting NHRP Globally

You can use either the BCC or Site Manager to delete NHRP services globally from the router.

Using the BCC

To delete NHRP using the BCC, you must first delete all NHRP interfaces configured on LEC, PVC, or SVC (Classical IP) services, then delete the global NHRP object.

For example, on a System 5000 router, the following commands:

- Delete NHRP from lec-service/newyork and from pvc-service/chicago.
- Delete global NHRP from all slots.

```
stack# atm/5/3/1
atm/5/3/1# lec-service/newyork
lec-service/newyork# nhrp
nhrp/newyork# delete
lec-service/newyork# pvc-service/chicago
pvc-service/chicago# nhrp
nhrp/chicago# delete
pvc-service/chicago# stack
stack# nhrp
nhrp/atm/ip# delete
stack#
```

Using Site Manager

To globally delete NHRP, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NHRP**.	The NHRP menu opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
4. Choose **Delete NHRP**.	Site Manager prompts whether you want to delete NHRP.
5. Click on **Yes**.	You return to the Configuration Manager window.

Where to Go Next

Use the following table to determine where to go next.

If you want to	**Go to**
Obtain an overview of MPOA and NHRP operation.	Chapter 1
Change default settings for MPOA server parameters.	Chapter 3
Obtain information about Site Manager NHRP parameters.	Appendix A
Obtain information about BCC NHRP parameters.	Appendix B
Monitor ATM using the BCC show commands.	Appendix C
Review a BCC MPOA/NHRP example configuration sequence.	Appendix D
Review the BCC configuration tree for MPOA and NHRP services.	Appendix E

Appendix A
Site Manager Parameters

This appendix contains the Site Manager parameter descriptions for MPOA and NHRP services. You can display the same information using Site Manager online Help.

The values you set for some parameters depend on the current settings of other (dependent) parameters.

This appendix contains the following information:

Topic	Page
Accessing ATM Parameters	A-1
MPOA Service Parameters	A-3
MPOA Server (MPS) Parameters	A-5
NHRP Global Parameters	A-14
NHRP Interface Parameters	A-19

Accessing ATM Parameters

You can access ATM parameters using either a Site Manager window path or menu path. Both of these paths begin at the Configuration Manager window.

The window path provides detailed information about individual ATM interfaces. The menu path provides global information about all interfaces on the router.

Accessing ATM MPOA Parameters Through a Window Path

ATM uses two main windows to access ATM parameters: the Select Connection Type window and the Edit ATM Connector window. You access MPOA parameters through the Edit ATM Connector window.

The Edit ATM Connector window acts as a control access point for all ATM parameters. This window provides information specific to each individual ATM interface.

For any given interface, the Edit ATM Connector window provides access to the MPOA server attributes. By clicking on the MPOA Server Attributes button, you can access and edit the parameters associated with MPOA on that specific ATM interface.

Accessing ATM MPOA and NHRP Parameters Through a Menu Path

The Protocols menu in the Configuration Manager window provides global interface and signaling information about every ATM interface on the router. For example, if you configure four ATM link modules on the router, and you select Protocols > ATM > Interfaces, the ATM Interface List window displays all four ATM interfaces that you configured on the router.

To access MPOA parameters, use the following menu path:

Configuration Manager > Circuits > Edit Circuits > Edit > ATM > MPOA Server Attributes

To access NHRP parameters, use the following menu path:

Configuration Manager > Protocols > IP > NHRP

The following sections provide additional menu paths for accessing MPOA or NHRP parameters.

MPOA Service Parameters

This section describes the parameters for configuring an ATM MPOA service record.

Parameter: **Enable/Disable**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes**

Default: Enable

Options: Enable | Disable

Function: Enables or disables the MPOA service record on this interface.

Instructions: Accept the default, Enable, if you want the MPOA service record to remain enabled on this interface. Select Disable if you do not want the MPOA service record enabled on this interface.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.1.1.2

Back to "Disabling and Reenabling an MPOA Service" on page 3-2.

Parameter: **MPS Address Generate Mode**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes**

Default: Automatic

Options: Automatic | Manual

Function: Specifies whether the MPS uses the network prefix it receives from the local switch (automatic mode) or uses address information that you specify (manual mode).

Instructions: Accept the default, Automatic, if you want the server to use the network prefix it receives from the local switch, and the MAC address from the underlying ATM interface. Select Manual if you want the server to use the address information (network prefix and user suffix) that you specify.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.1.1.7

Back to "Setting the MPS Address Generating Mode" on page 3-3.

Parameter: Ctrl ATM Addr Network Prefix

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes**

Default: None

Options: *XX*00000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFF

where *XX* = 39, 45, or 47

Function: Specifies the network prefix of the ATM address for this MPOA service record. The network prefix specifies the ATM domain of which any MPOA server will be a member. The router uses the MPOA service record address information as a base when creating a new MPS.

The *XX* byte must be 39, 45, or 47. This value defines the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format the prefix uses. For more information about the AFI byte, see the ATM Forum UNI specification.

The router configures this value for you in automatic mode. You have the option of configuring this value in manual mode.

Instructions: Enter a network prefix (manual mode only).

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.5

Back to "Specifying an MPS Control ATM Address" on page 3-5.

Parameter:	**Ctrl ATM Addr User Part**
Path:	Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes**
Default:	None
Options:	00000000000000 to FFFFFFFFFFFFFF
Function:	Specifies the user part (suffix) of the ATM address for the MPOA service record. The user part suffix consists of a 6-byte end-station identifier and a 1-byte selector field. The router uses the MPOA service record address information as a base when creating a new MPS. The router configures this value for you in automatic mode. You must configure this value in manual mode.
Instructions:	Enter an ATM address user part (manual mode only).
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.10.2.5

Back to "Specifying an MPS Control ATM Address" on page 3-5.

MPOA Server (MPS) Parameters

This section describes the parameters for configuring an ATM MPOA server (MPS) on an MPOA service record. You must:

- Add a new MPS (see the next section, "MPS Add Parameters").
- Customize MPS operational parameters (see "MPS Operational Parameters" on page A-7).

MPS Add Parameters

This section describes the parameters for creating (adding) a new MPS on an MPOA service.

Parameter: LECS ATM Addr Network Prefix

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS** > **Add**

Default: None

Options: *XX*00000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFFF

where *XX* = 39, 45, or 47

Function: Specifies the ATM network prefix of the LECS from which a new MPS can obtain configuration values automatically. (The MPS Config Mode must be set to automatic for this to occur.) The network prefix specifies the ATM domain of which this MPOA server is a part.

The *XX* byte must be 39, 45, or 47. This value defines the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format the prefix uses. For more information about the AFI byte, see the ATM Forum UNI specification.

Instructions: Enter the network prefix for the LECS you want the MPS to use. Use the network prefix of the well-known LECS if you have no other address to use.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.15

Back to "Specifying a LECS ATM Address" on page 3-11.

Parameter: LECS ATM Address User Part

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS** > **Add**

Default: None

Options: 00000000000000 to FFFFFFFFFFFFFF

Function: Specifies the user part (suffix) of the LECS from which a new MPS can obtain configuration values automatically. (The MPS Config Mode must be set to automatic for this to occur.). The user part suffix consists of a 6-byte end-station identifier and a 1-byte selector field.

The user part and the network prefix form a complete ATM address.

Instructions: Enter the ATM address user part of the LECS that you want the MPS to use.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.15

Back to "Specifying a LECS ATM Address" on page 3-11.

Parameter: **MPS Ctrl ATM Address Selector Byte**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS** > **Add**

Default: None

Options: 00 to FF

Function: Specifies a 1-byte selector field for the MPS. You need only configure this parameter when the control ATM address generate mode is manual.

The MPS uses the end-station identifier of the service record control ATM address user part. However, each MPS must have a unique selector field value.

Instructions: Enter a unique 1-byte selector field for the MPS.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.5

Back to "Configuring a Unique Selector Byte for an MPS Address" on page 3-14.

MPS Operational Parameters

This section describes the operational parameters you can customize for a new MPS.

Parameter: **Enable/Disable**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: Enable

Options: Enable | Disable

Function: Enables or disables the selected MPS.

Instructions: Accept the default, Enable, if you want the MPS to remain enabled on this interface. Select Disable if you do not want the MPS enabled on this interface.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.1.1.2

Back to "Disabling and Reenabling MPOA Servers" on page 3-8.

Parameter: **MPS Address Generate Mode**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: Automatic

Options: Automatic │ Manual

Function: Display only. You can configure this parameter only at the service record level.

Instructions: None

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.1.7

Back to "Setting the MPS Address Generating Mode" on page 3-3.

Parameter: **Ctrl ATM Addr Network Prefix (Optional)**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: None

Options: *XX*00000000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFFFF

where *XX* = 39, 45, or 47

Function: Display only. You can configure this parameter only at the service record level.

Instructions: None

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.5

Back to "Specifying an MPS Control ATM Address" on page 3-5.

Parameter: **Ctrl ATM Addr User Part**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: None

Options: 00000000000000 to FFFFFFFFFFFFFF

Function: Display only. You can configure this parameter only at the service record level.

Instructions: None

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.5

Back to "Specifying an MPS Control ATM Address" on page 3-5.

Parameter: **MPS Config Mode**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: Automatic

Options: Automatic | Manual

Function: Specifies whether the MPS configures automatically (that is, uses timer information from the LECS) or manually (that is, uses timer information from the MPS List window).

Instructions: Accept the default, Automatic, if you want the server to configure automatically. If automatic, you must enter in the MPS Add window the ATM address network prefix and user suffix of the LEC that you want the MPS to use. Select Manual if you do not want the server to autoconfigure. If manual, you do not have to enter any ATM address information in the MPS Add window.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.4

Back to "Specifying the MPS Configuration Mode" on page 3-10.

Parameter: Default Holding Time

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 20

Options: 1 to 120

Function: Specifies in minutes the time used in NHRP resolution replies.

Instructions: Accept the default, 20, or enter a value from 1 to 120.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.11

Back to "Setting the Valid Interval for Replies to Resolution Requests" on page 3-23.

Parameter: Give Up Time

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 40

Options: 5 to 300

Function: Specifies in seconds the maximum amount of time that the MPS must wait before giving up on a pending resolution request.

Instructions: Accept the default, 40, or enter a value from 5 to 300.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.10

Back to "Setting the Time to Wait for Responses to Resolution Requests" on page 3-22.

Parameter: **Initial Cache Size**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 100

Options: 50 to 500

Function: Specifies in cache units the maximum amount of cache information that the MPS can keep upon initialization.

Instructions: Accept the default, 100, or enter a value from 50 to 500.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.13

Back to "Setting the Initial Cache Size" on page 3-25.

Parameter: **Initial Retry Time**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 5

Options: 1 to 300

Function: Specifies the initial retry time (in seconds) used by the MPOA retry mechanism.

Instructions: Accept the default, 5, or enter a value from 1 to 300.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.8

Back to "Setting the Initial Retry Time" on page 3-19.

Parameter: Keep Alive Life Time

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 35

Options: 3 to 1000

Function: Specifies the length of time (in seconds) that an MPS can consider a keepalive packet as valid.

Instructions: Accept the default, 35, or enter a value from 3 to 1000.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.7

Back to "Setting the Valid Lifetime for Keepalive Packets" on page 3-18.

Parameter: Keep Alive Time

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 10

Options: 1 to 300

Function: Specifies how often (in seconds) the MPS must transmit MPOA keepalive packets.

Instructions: Accept the default, 10, or enter a value from 1 to 300.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.6

Back to "Setting the Transmission Interval for MPOA Keepalive Packets" on page 3-17.

Parameter: **Maximum Cache Size**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 500

Options: 100 to 2000

Function: Specifies in cache units the maximum amount of cache information that the MPS can store at any time.

Instructions: Accept the default, 500, or enter a value from 100 to 2000.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.14

Back to "Setting the Maximum Cache Size" on page 3-26.

Parameter: **Maximum Retry Time**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **ATM** > **MPOA Server Attributes** > **MPS**

Default: 40

Options: 10 to 300

Function: Specifies the maximum retry time (in seconds) used by the MPOA retry mechanism.

Instructions: Accept the default, 40, or enter a value from 10 to 300.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.10.2.1.9

Back to "Setting the Maximum Retry Time" on page 3-21.

NHRP Global Parameters

This section describes the NHRP global parameters.

Parameter: Client Enable

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: Enable

Options: Enable | Disable

Function: Enables or disables the NHRP client entity on this ATM interface.

Instructions: Accept the default, Enable, to enable the NHRP client entity. This enables MPOA to establish ATM network cut-through paths. Select Disable to disable the NHRP client entity and prevent MPOA from establishing ATM network cut-through paths.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.5

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: Client Reg Interval

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: 25

Options: 10 to 200

Function: Specifies the registration interval, in seconds, for the NHRP client entity. The registration interval determines how often the NHRP client generates NHRP registration requests to refresh and update its next-hop cache.

Instructions: In most configurations, accept the default value. When using a nondefault value, make it smaller than the current value of the Client Hold Time parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.6

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: Client Hold Time

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: 30

Options: 10 to 200

Function: Specifies the length of time, in seconds, during which client information is valid.

Instructions: In most configurations, accept the default value. To ensure that you always have recent client information, specify a low value. Such a low value, however, will cause additional network traffic, because more frequent NHRP registration requests result. If you specify a higher value, network traffic will decrease at the expense of less current cache information. If using other than default values, ensure that this value is greater than the value of the Client Reg Interval parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.7

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: Client Request Timeout

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: 3

Options: 1 to 100

Function: Specifies the maximum amount of time that the NHRP client waits to receive a reply from an NHRP server.

Instructions: In most configurations, accept the default value. If using other than the default value, specify a value large enough to account for propagation delays between the NHRP client and remote NHRP servers, as well as any other typical processing delays.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.8

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: Client Request Retry

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: 3

Options: 1 to 20

Function: Specifies the number of times that the NHRP client generates NHRP registration requests. If an NHRP registration response is not received after the specified number of attempts, the NHRP client returns an error indication to the local requesting entity (that is, the MPS).

Instructions: In most configurations, accept the default value. If using other than the default value, keep in mind that higher values may degrade application responsiveness.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.9

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: Client Max Pending Request Entries

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: 100

Options: 1 to 100

Function: Specifies the maximum number of pending requests that the NHRP client will accept from the local requesting entity (that is, the MPS).

Instructions: In most configurations, accept the default value. Ensure that you have sufficient memory space to accommodate the number of pending requests that you specify.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.10

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: **Max Next Hop Cache Size**

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable
Default: 16
Options: 16 to 1024
Function: Specifies in cache units the maximum size of the next-hop cache.
Instructions: In most configurations, accept the default value. Specifying a higher value uses more buffer space, resulting in less memory for other system requirements.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.20

Parameter: **Server Enable**

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable
Default: Enable
Options: Enable | Disable
Function: Enables or disables the NHRP server entity on this ATM interface.
Instructions: In virtually all configurations, accept the default value. This also enables MPOA to function properly. Select Disable to disable the NHRP server entity and MPOA functionality.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.11

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: **Server Forward Enable**

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable
Default: Enable
Options: Enable | Disable
Function: Enables or disables NHRP server request forwarding to other NHRP servers if the requested address resolution is not cached locally.
Instructions: In virtually all configurations, accept the default value. Select Disable to disable NHRP request forwarding. Accept the default, Enable, to enable NHRP request forwarding.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.12

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: Server Max Next Hop Entries

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: 5

Options: 1 to 20

Function: Specifies the maximum number of next-hop entries that the server keeps. If the NHRP resolution reply message contains more than the configured maximum number of entries, the last entries are discarded.

Instructions: In most configurations, accept the default value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.13

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: Server Max Pending Request Entries

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable

Default: 100

Options: 1 to 100

Function: Specifies the maximum number of pending requests that the router will queue.

Instructions: In most configurations, accept the default value. Ensure that you have sufficient memory space to accommodate the number of pending requests that you specify.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.1.1.14

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

NHRP Interface Parameters

This section describes the only configurable parameter of an NHRP interface.

Parameter: Enable

Path: Configuration Manager > Protocols > IP > NHRP > Interfaces

Default: Enable

Options: Enable | Disable

Function: Enables or disables NHRP on an ATM interface.

Instructions: Accept the default value, Enable, to enable NHRP on the ATM interface. Select Disable to disable NHRP on the interface.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.23.2.1.2

Appendix B
BCC Parameters

This appendix contains BCC parameter descriptions for MPOA and NHRP services. You can display the same information using BCC help-oriented commands, such as **help** *<object_name>* and **help** *<parameter_name>*. For more information on these commands, see *Using the Bay Command Console (BCC)*.

Note that the values you set for some parameters depend on the current settings of other parameters. Accept all default settings for NHRP unless your network has special configuration requirements.

This appendix contains the following information:

Topic	Page
MPOA Service Record Parameters	B-2
MPS Parameters	B-4
MPOA Server Parameters	B-8
NHRP Global Parameters	B-9
NHRP Interface Parameter	B-13

MPOA Service Record Parameters

This section describes the parameters for configuring an MPOA service record (mpoa-service).

Parameter: autogenerate

Path: box or stack > atm > mpoa-service

Default: enabled

Options: enabled | disabled

Function: Specifies whether the MPS is enabled to automatically use the ATM network prefix value it receives from the network switch. If you disable autogeneration, the MPS derives ATM network prefix from your manually configured values for MPOA service parameters network-prefix and user-suffix.

Back to "Setting the MPS Address Generating Mode" on page 3-3.

Parameter: network-prefix

Path: box or stack > atm > mpoa-service

Default: None

Options: *XX*00000000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFFFF

XX = 39, 45, or 47

Function: Used only when ATM address autogeneration is disabled, the network prefix specifies the ATM domain of which any MPOA server (MPS) will be a member. The router uses the MPOA service address information as a base when creating a new MPS. (See also the definition for the autogenerate parameter.)

The *XX* byte must be 39, 45, or 47. This value defines the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format the prefix uses. For more information about the AFI byte, see the ATM Forum UNI specification.

The router configures the network prefix automatically with address autogeneration enabled.

Back to "Specifying an MPS Control ATM Address" on page 3-5.

Parameter: state

Path: box or stack > atm > mpoa-service

Default: enabled

Options: enabled | disabled

Function: Specifies the configured state of the MPOA service. Changing the value of this parameter also administratively enables or disables this MPOA service.

Back to "Disabling and Reenabling an MPOA Service" on page 3-2.

Parameter: user-suffix

Path: box or stack > atm > mpoa-service

Default: None

Options: 00000000000000 to FFFFFFFFFFFFFF

Function: Used only when ATM address autogeneration is disabled, the user suffix specifies a 6-byte end-station identifier and a 1-byte selector field. The router uses this information as a base when creating a new MPS. (See also the definition for the autogenerate parameter.)

The router configures a user suffix for you automatically with address autogeneration enabled.

Back to "Specifying an MPS Control ATM Address" on page 3-5.

MPS Parameters

This section describes the parameters for configuring an MPOA server (MPS).

Parameter: config-mode

Path: box or stack > atm > mpoa-service > mps

Default: automatic

Options: automatic | manual

Function: Specifies whether the MPS configures automatically (using timer information from the LECS) or manually (using intervals configured for timer parameters of this MPS). Enter manual if you do not want this MPS to autoconfigure.

Back to "Specifying the MPS Configuration Mode" on page 3-10.

Parameter: control-atm-address

Path: box or stack > atm > mpoa-service > mps

Default: None

Options: The 20-byte MPS control ATM address, consisting of a network prefix and a user suffix.

Network prefix:
*XX*00000000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFFFF
where *XX* = 39, 45, or 47

User suffix:
00000000000000 to FFFFFFFFFFFFFF
where the least significant (selector byte) of the user suffix must be a unique value for each MPS in the device configuration.

Function: Specifies the unique control ATM address used by this MPS to obtain address (for example, ATM domain) information.

Back to "Configuring a Unique Selector Byte for an MPS Address" on page 3-14.

Parameter: default-holding-time

Path: box or stack > atm > mpoa-service > mps

Default: 20

Options: 1 to 120

Function: Specifies the time (in minutes) used in NHRP resolution replies.

Back to "Setting the Valid Interval for Replies to Resolution Requests" on page 3-23.

Parameter: give-up-time

Path: box or stack > atm > mpoa-service > mps

Default: 40

Options: 5 to 300

Function: Specifies in seconds the maximum amount of time that the MPS must wait before giving up on a pending resolution request.

Back to "Setting the Time to Wait for Responses to Resolution Requests" on page 3-22.

Parameter: initial-cache-size

Path: box or stack > atm > mpoa-service > mps

Default: 100

Options: 50 to 500

Function: Specifies the maximum amount of cache information that the MPS can keep upon initialization.

Back to "Setting the Initial Cache Size" on page 3-25.

Parameter: initial-retry-time

Path: box or stack > atm > mpoa-service > mps

Default: 5

Options: 1 to 300

Function: Specifies the initial retry time (in seconds) used when making MPOA resolution requests and cache imposition requests.

Back to "Setting the Initial Retry Time" on page 3-19.

Parameter: keep-alive-lifetime

Path: box or stack > atm > mpoa-service > mps

Default: 35

Options: 3 to 1000

Function: Specifies the length of time (in seconds) that an MPS can consider a keepalive packet as valid.

Back to "Setting the Valid Lifetime for Keepalive Packets" on page 3-18.

Parameter: keep-alive-time

Path: box or stack > atm > mpoa-service > mps

Default: 10

Options: 1 to 300

Function: Specifies how often (in seconds) the MPS must transmit MPOA keepalive packets.

Back to "Setting the Transmission Interval for MPOA Keepalive Packets" on page 3-17.

Parameter: lecs-address

Path: box or stack > atm > mpoa-service > mps

Default: None

Options: The 20-byte ATM address of the LECS from which a new MPS can obtain configuration values automatically. (The MPS config-mode parameter must be set to automatic for this to occur.). The address includes a network prefix and a user suffix.

Network prefix:
*XX*00000000000000000000000 to *XX*FFFFFFFFFFFFFFFFFFFFFF
where *XX* = 39, 45, or 47

User suffix:
00000000000000 to FFFFFFFFFFFFFF

Function: Specifies the network prefix (13 bytes) and user suffix (7 bytes) of the ATM address for the LECS that you want the MPOA server to use. The network prefix specifies the ATM domain of which this MPOA server is a part. The *XX* byte defines the authority and format identifier (AFI), designating the group responsible for allocating the network prefix and the format of the prefix.

Back to "Specifying a LECS ATM Address" on page 3-11.

Parameter: maximum-cache-size

Path: box or stack > atm > mpoa-service > mps

Default: 500

Options: 100 to 2000

Function: Specifies the maximum amount of cache information that the MPS can store at any time.

Back to "Setting the Maximum Cache Size" on page 3-26.

Parameter: retry-time-maximum

Path: box or stack > atm > mpoa-service > mps
Default: 40
Options: 10 to 300
Function: Specifies the maximum retry time (in seconds) used when making MPOA resolution requests and cache imposition requests.

Back to "Setting the Maximum Retry Time" on page 3-21.

Parameter: state

Path: box or stack > atm > mpoa-service > mps
Default: enabled
Options: enabled | disabled
Function: Indicates the configured state of the MPS. Changing the default value of this parameter to "disabled" administratively disables this MPS.

Back to "Disabling and Reenabling MPOA Servers" on page 3-8.

MPOA Server Parameters

Parameter: state

Path: box or stack > atm > lec-service > mpoa-server
Default: enabled
Options: enabled | disabled
Function: Indicates the configured state of the MPS to LEC Service mapping relationship. Changing the value to "disabled" prevents the associated MPS from using the LEC Service for communication with another MPS.

Back to "Disabling and Reenabling MPOA Servers" on page 3-8.

Parameter: mps-name

Path: box or stack > atm > lec-service > mpoa-server
Default: None
Options: enabled | disabled
Function: Indicates the configured state of the MPS to LEC Service mapping relationship. Changing the value to "disabled" prevents the named MPS from using the underlying LEC Service for communication with another MPS.

Back to "Disabling and Reenabling MPOA Servers" on page 3-8.

NHRP Global Parameters

This section describes NHRP network global configuration parameters.

Parameter: client

Path: box or stack > nhrp
Default: enabled
Options: enabled | disabled
Function: Indicates the configured state of the NHRP client. Changing the default value to disabled administratively disables the NHRP client.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: client-registration-interval

Path: box or stack > nhrp
Default: 25
Options: 10 to 200
Function: Specifies in seconds the interval between registration requests from the NHRP client attempting to refresh and update its next-hop cache. Shorter intervals result in a more up-to-date cache at the expense of increased traffic. Longer intervals have the reverse effect.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: client-hold-time

Path: box or stack > nhrp

Default: 30

Options: 10 to 200

Function: Specifies the length of time, in seconds, during which client information is valid.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: client-request-retry

Path: box or stack > nhrp

Default: 3

Options: 1 to 20

Function: Specifies the number of times that the NHRP client generates a registration request before returning an error to the local requesting (MPS) entity.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: client-request-timeout

Path: box or stack > nhrp

Default: 10

Options: 1 to 100

Function: Specifies in seconds the maximum amount of time that the NHRP client waits to receive a reply from an NHRP server. Make the value large enough to account for processing and propagation delays between the NHRP client and remote NHRP servers.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: client-requests-maximum

Path: box or stack > nhrp
Default: 100
Options: 1 to 100
Function: Specifies the maximum number of pending requests the NHRP client will accept from the local requesting MPS. Memory space must be sufficient to accommodate the number of pending requests that you specify.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: next-hop-cache-size

Path: box or stack > nhrp
Default: 16
Options: 16 to 1024
Function: Specifies the maximum size of the next-hop cache. Higher values use more buffer space, resulting in less memory for other system processing.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: server

Path: box or stack > nhrp
Default: enabled
Options: enabled | disabled
Function: Indicates the configured state of the NHRP server. Changing the default value to disabled administratively disables the NHRP server on this ATM interface.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: server-forwarding

Path: box or stack > nhrp
Default: enabled
Options: enabled | disabled
Function: Enables or disables the forwarding of NHRP server requests to other NHRP servers when address resolution information is not cached locally.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: server-next-hop-maximum

Path: box or stack > nhrp
Default: 5
Options: 1 to 20
Function: Specifies the maximum number of next-hop entries held by the server. If the NHRP resolution reply message has more entries than the value you specify, the router discards the excess (most recent) entries in the message.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

Parameter: server-requests-maximum

Path: Configuration Manager > Protocols > IP > NHRP > NhrpNetTable
Default: 100
Options: 1 to 100
Function: Specifies the maximum number of pending server requests the router can queue. Local memory space must be sufficient to accommodate the number of pending requests that you specify.

Back to "Accessing NHRP Client and Server Global Parameters" on page 4-2.

NHRP Interface Parameter

This section describes the only configurable NHRP parameter enabled on an LEC, PVC, or Classical IP (SVC) service.

Parameter: state

Path: box or stack > {lec-service | pvc-service | classical-ip-service} > nhrp

Default: enabled

Options: enabled | disabled

Function: Indicates the configured state of NHRP on the ATM interface. Changing the default value to disabled administratively disables NHRP on the ATM interface.

Back to "Disabling NHRP on an LEC or PVC or Classical IP Service" on page 4-4.

Appendix C
Monitoring MPOA and NHRP Services

To display configuration and statistical data about MPOA and NHRP services from the management information base (MIB), use the BCC **show** command.

This appendix includes information about getting online Help for BCC show commands, and describes the following commands:

Command	Page
show mpoa caches	C-3
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Online Help for show Commands

To display a list of command options, enter one of these commands at any BCC prompt:

- **show mpoa ?**
- **show nhrp ?**

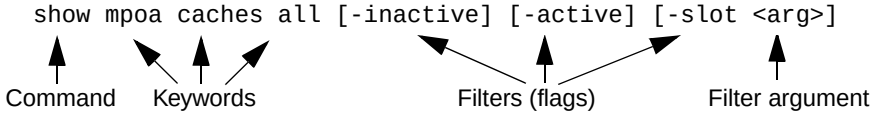
To learn more about any **show** command and its options (keywords, filters, and filter arguments), use the question mark (**?**) command as follows:

Example

```
bcc> show mpoa ?
  caches  server
bcc> show mpoa caches ?
  all     egress  ingress
bcc> show mpoa caches all ?
show mpoa caches all [-inactive] [-active] [-slot <arg>]
bcc>
```

The BCC has fully displayed all possible options for the current command line when:

- The response contains command filters and filter arguments
- The response is a message: `No further options available.`



show mpoa caches

The **show mpoa caches** command displays information about MPOA caches on ATM interfaces configured on the router. You can enter the following optional versions of this command:

show mpoa caches all

show mpoa caches egress

show mpoa caches ingress

In addition, you can constrain the output of these commands by specifying the following filters in any combination:

-active	Displays information about MPOA active caches only
-inactive	Displays information about MPOA inactive caches only
-slot <*slot*>	Displays information about MPOA caches on ATM interfaces configured on this slot only

show mpoa caches all

The **show mpoa caches all** command displays information about all MPOA ingress and egress caches on ATM interfaces configured on the router.

The following examples also show how to apply some of the filters described in "show mpoa caches."

Examples

show mpoa caches all	Displays information about active and inactive MPOA ingress and egress caches on all slots
show mpoa caches all -slot 3	Displays information about active and inactive MPOA ingress and egress caches on slot 3 only

(continued)

show mpoa caches all -active	Displays information about active MPOA ingress and egress caches only, on all slots
show mpoa caches all -inactive	Displays information about inactive MPOA ingress and egress caches only, on all slots
show mpoa caches all -active -slot 3	Displays information about active MPOA ingress and egress caches on slot 3 only

When you enter this command, with or without filters, the BCC displays the following information:

Cache Id	The identifier associated with this cache entry
Dest ATM Address	The ATM Address resolved by an egress MPC
DLL Header	The data link layer header associated with this entry
Dst Prot Address	The ingress MPS destination internetwork layer address
Elan Id	The ELAN identifier on which this cache imposition was sent
Hold Time	The time interval during which this value is valid
Index	The MPS index associated with this entry
MPOA Server	The user-assigned name of the MPS
Next Hop Prot	The next-hop protocol address
Slot	The number of the slot on which this MPS is configured
Source ATM Address (ingress)	The ATM address associated with the source of this MPOA request (the ingress MPC's control ATM address)
Source ATM Address (egress)	The ingress NHC's ATM address used in the original cache imposition
Src Prot Addr	The ingress MPS source internetwork layer address
State	The operational state of this cache entry

show mpoa caches egress

The **show mpoa caches egress** command displays information about MPOA egress caches on ATM interfaces configured on the router.

The following examples also show how to apply some of the filters described in "show mpoa caches."

Examples

show mpoa caches egress	Displays information about active and inactive MPOA egress caches on all slots
show mpoa caches egress -slot 3	Displays information about active and inactive MPOA egress caches on slot 3 only
show mpoa caches egress -active	Displays information about active MPOA egress caches only, on all slots
show mpoa caches egress -inactive	Displays information about inactive MPOA egress caches only, on all slots
show mpoa caches egress -active -slot 3	Displays information about active MPOA egress caches on slot 3 only

When you enter this command, with or without filters, the BCC displays the following information:

Cache Id	The identifier associated with this cache entry
DLL Header	The data link layer header associated with this entry
Elan Id	The ELAN identifier on which this cache imposition was sent
Hold Time	The time interval during which this value is valid
Index	The MPS index associated with this entry
MPOA Server	The user-assigned name of the MPS
Next Hop Prot	The next-hop protocol address
Slot	The number of the slot on which this MPS is configured
Source ATM Address	The ingress NHC's ATM address used in the original cache imposition
State	The operational state of this cache entry

show mpoa caches ingress

The **show mpoa caches ingress** command displays information about MPOA ingress caches on ATM interfaces configured on the router.

The following examples also show how to apply some of the filters described in "show mpoa caches."

Examples

show mpoa caches ingress	Displays information about active and inactive MPOA ingress caches on all slots
show mpoa caches inegress -slot 3	Displays information about active and inactive MPOA ingress caches on slot 3 only
show mpoa caches ingress -active	Displays information about active MPOA ingress caches only, on all slots
show mpoa caches ingress -inactive	Displays information about inactive MPOA ingress caches only, on all slots
show mpoa caches ingress -active -slot 3	Displays information about active MPOA ingress caches on slot 3 only

When you enter this command, with or without filters, the BCC displays the following information:

Dest ATM Address	The ATM Address resolved by an ingress MPC
Dst Prot Address	The ingress MPS destination internetwork layer address
Hold Time	The time interval during which this value is valid
Index	The MPS index associated with this entry
MPOA Server	The user-assigned name of the MPS
Slot	The number of the slot on which this MPS is configured
Source ATM Address (ingress)	The ATM address associated with the source of this MPOA request (the ingress MPC's control ATM address)
Src Prot Addr	The ingress MPS source internetwork layer address
State	The operational state of this cache entry

show mpoa server

The **show mpoa server** command displays information about MPOA servers configured on the router. You can enter the following optional versions of this command:

show mpoa server configuration

show mpoa server stats

In addition, you can control the output of these commands by specifying the following filters in any combination:

-enabled	Displays information about only MPOA servers with a configured state of enabled
-disabled	Displays information about only MPOA servers with a configured state of disabled
-mps *<mps_name>*	Displays information about this MPOA server only
-slot *<slot>*	Displays information about MPOA servers on this slot only

show mpoa server configuration

The **show mpoa server configuration** command displays configuration data for MPOA servers configured on the router.

The following examples also show how to apply some of the filters described in "show mpoa server."

Examples

show mpoa server configuration	Displays configuration data for active and inactive MPOA servers on all slots
show mpoa server configuration -slot 3	Displays configuration data for active and inactive MPOA servers on slot 3 only

(continued)

show mpoa server configuration -enabled	Displays configuration data only for enabled MPOA servers on all slots
show mpoa server configuration -disabled	Displays configuration data only for disabled MPOA servers on all slots
show mpoa server configuration -enabled -slot 3	Displays configuration data for enabled MPOA servers on slot 3 only
show mpoa server configuration -mps boston	Displays configuration data for MPOA server “boston”

When you enter this command, with or without filters, the BCC displays the following information:

Configuration	Indicates whether this MPOA server configures automatically (using timer information from the LECS) or manually (using local timer parameter values set for this MPOA server)
Control ATM Address	The unique control ATM address used by this MPS to obtain address (for example, ATM domain) information. The address includes a network prefix and a user suffix.
Default Holding Time	The holding time in minutes used for NHRP resolution replies. An egress MPS may use local information to determine a more appropriate holding time.
Give Up Time	The maximum amount of time in seconds that this MPS must wait before giving up on a pending resolution request
Index	The value of the wfmpsIndex attribute in the MPS MIB. Combined with the value of the wfmpsNextIndex attribute, uniquely identifies this MPOA server entry in the wfmpsConfigTable. The index value must remain unchanged in the event of MPS reinitialization, but can change in the event of agent reinitialization.
Initial Retry Time	The initial retry time in seconds used by the MPOA retry mechanism
Keep Alive Lifetime	The interval in seconds during which this MPS will consider a keepalive packet valid. This value must be at least three times the Keep Alive Time.
Keep Alive Time	The period in seconds between MPOA keepalive packets

Lane Clients	The user-assigned name for the circuit assigned to any LEC associated with this MPS
MPS Name	The user-assigned name for this MPOA server
Retry Time Maximum	The maximum retry time in seconds used by the MPOA retry mechanism
Slot	The number of the slot on which this MPOA server is configured
State	The configured state of this MPOA server

show mpoa server stats

The **show mpoa server stats** command displays runtime statistics for MPOA servers (MPSs) configured on the router.

The following examples also show how to apply some of the filters described in "show mpoa server."

Examples

show mpoa server stats	Displays statistical data for enabled and disabled MPOA servers on all slots
show mpoa server stats -slot 3	Displays statistical data for enabled and disabled MPOA servers on slot 3 only
show mpoa server stats -enabled	Displays statistical data only for enabled MPOA servers on all slots
show mpoa server stats -disabled	Displays statistical data only for disabled MPOA servers on all slots
show mpoa server stats -enabled -slot 3	Displays statistical data for enabled MPOA servers on slot 3 only
show mpoa server stats -mps boston	Displays statistical data for MPOA server "boston" only

When you enter this command, with or without filters, the BCC displays the following information:

Cache Imposition Reply Rx	The number of successful MPOA cache imposition replies received by this MPS that contain an MPOA CIE code 0x00 - success. Discontinuities in the value of this counter can occur upon reinitialization of the management system or the MPS. Discontinuities can also occur at other times, as indicated by the value of the wfmpsDiscontinuityTime attribute of the MPS MIB.
Cache Imposition Req Tx	The number of MPOA cache imposition requests transmitted by this MPS. Discontinuities in the value of this counter can occur upon reinitialization of the management system or the MPS. Discontinuities can also occur at other times, as indicated by the value of the wfmpsDiscontinuityTime attribute of the MPS MIB.
Configuration	Indicates whether this MPOA server configured automatically (using timer information from the LECS) or manually (using local timer parameter values set for this MPOA server) when last initialized
Control ATM Address	The unique control ATM address used by this MPS to obtain address (for example, ATM domain) information. The address includes a network prefix and a user suffix.
Default Holding Time	The holding time in minutes used for NHRP resolution replies. An egress MPS may use local information to determine a more appropriate holding time.
Egress Purge Reply Tx	The number of MPOA egress cache purge replies transmitted by this MPS. Discontinuities in the value of this counter can occur upon reinitialization of the management system or the MPS. Discontinuities can also occur at other times, as indicated by the value of the wfmpsDiscontinuityTime attribute of the MPS MIB.
Egress Purge Req Rx	The number of MPOA egress cache purge requests received by this MPS. Discontinuities in the value of this counter can occur upon reinitialization of the management system or the MPS. Discontinuities can also occur at other times, as indicated by the value of the wfmpsDiscontinuityTime attribute of the MPS MIB.
Give Up Time	The maximum amount of time in seconds that this MPS must wait before giving up on a pending resolution request

Index	The value of the wfmpsIndex attribute in the MPS MIB. Combined with the value of the wfmpsNextIndex attribute, uniquely identifies this MPOA server entry in the wfmpsConfigTable. The index value must remain unchanged in the event of MPS reinitialization, but can change in the event of agent reinitialization.
Initial Retry Time	The initial retry time in seconds used by the MPOA retry mechanism
Keep Alive Lifetime	The interval in seconds during which this MPS will consider a keepalive packet valid. This value must be at least three times the Keep Alive Time.
Keep Alive Time	The period in seconds between MPOA keepalive packets
MPS Name	The user-assigned name for this MPOA server
Resolve Reply Ack Tx	The number of MPOA resolve replies transmitted by this MPS that contain the MPOA CIE Code 0x00 - success. Discontinuities in the value of this counter can occur upon reinitialization of the management system or the MPS. Discontinuities can also occur at other times, as indicated by the value of the wfmpsDiscontinuityTime attribute of the MPS MIB.
Resolve Request Rx	The number of MPOA resolve requests received by this MPS and translated to NHRP resolve requests. Discontinuities in the value of this counter can occur upon reinitialization of the management system or the MPS. Discontinuities can also occur at other times, as indicated by the value of the wfmpsDiscontinuityTime attribute of the MPS MIB.
Retry Time Maximum	The maximum retry time in seconds used by the MPOA retry mechanism
Slot	The number of the slot on which this MPOA server is configured
State	The configured state of this MPOA server

show nhrp

The **show nhrp** command displays information about the Next Hop Routing Protocol (NHRP). You can enter the following optional versions of the **show nhrp** command:

show nhrp client configuration

show nhrp server configuration

show nhrp client stats

show nhrp server stats

show nhrp interfaces

show nhrp client configuration

The **show nhrp client configuration** command displays configuration information about the NHRP client on the router. When you enter this command, the BCC displays the following information:

Client Enable	The configured state of this NHRP client (enabled or disabled)
Hold Time	The period in seconds during which client information is valid
Link Protocol	The type of layer 2 network (ATM or frame relay)
Network Protocol	Type of layer 3 protocol (for example, IP)
Pending Requests	The maximum number of pending requests allowed for this NHRP client
Registration Interval	The interval in seconds between NHRP client registration requests, each of which refresh and update the client's next-hop cache. The interval must be less than the NHRP client hold time.
Request Retries	The number of times that the NHRP client generates NHRP registration requests. If an NHRP registration response is not received after the specified number of attempts, the NHRP client returns an error to the local requesting entity (the MPS).
Request Timeout	The maximum amount of time that the NHRP client waits to receive a reply from an NHRP server

show nhrp client stats

The **show nhrp client stats** command displays statistical information about the NHRP client on the router. When you enter this command, the BCC displays the following information:

Errors Rx	The number of NHRP error indication packets received by this client
Errors Tx	The number of NHRP error indication packets transmitted by this client
Link Protocol	The layer 2 protocol used by this client (ATM or frame relay)
Local Errors	The number of local errors that occurred on this client
Local Retry	The number of retries made for client requests
Network Protocol	The layer 3 protocol used by this client (for example, IP)
Purge ACK	The number of positive NHRP purge replies received by this client
Purge NAK	The number of negatively acknowledged (NAK) NHRP purge replies received by this client
Purge Request	The number of NHRP purge requests transmitted by this client
Register ACK	The number of positively acknowledged NHRP registration replies received by this client
Register NAK	The number of negatively acknowledged (NAKed) NHRP registration replies received by this client
Register Request	The number of NHRP registration requests transmitted by this client
Resolve ACK	The number of positively acknowledged NHRP resolution replies received by this client
Resolve NAK	The number of NAKed NHRP resolution replies received by this client
Resolve Request	The number of NHRP resolution requests transmitted by this client
Unsolicit Purge	The number of unsolicited purge requests received by this client

show nhrp interfaces

The **show nhrp interfaces** command displays information about NHRP interfaces configured on the router. You can control the output of this command by specifying the following filters in any combination:

-enabled	Displays information only about NHRP interfaces with a configured state of enabled
-disabled	Displays information only about NHRP interfaces with a configured state of disabled
-pvc	Displays NHRP interface information only for permanent virtual circuits (PVCs)
-service *<servicename>*	Displays NHRP interface information for this service only
-slot *<slot>* [**/***<module>*] [**/***<connector>*]	Displays information about NHRP interfaces on this slot and (optionally) connector only. (Supply a *<module>* argument only for ASN and System 5000 platforms.)
-svc	Displays NHRP interface information for switched virtual circuits (SVCs) only

Examples:

show nhrp interfaces -enabled
show nhrp interfaces -disabled -pvc
show nhrp interfaces -enabled -service alpha -slot 3
show nhrp interfaces -svc -service beta
show nhrp interfaces -enabled -service beta -slot 4

When you enter this command, with or without filters, the BCC displays the following information:

Link Protocol	The layer 2 protocol used by this NHRP interface (ATM)
Network Protocol	The layer 3 protocol used by this NHRP interface (IP)
Packets Tx	The number of NHRP packets sent from this interface
Service	The unique name assigned to the service record by a user
Slot/Module/Conn	The slot (all routers), module (ASN and System 5000 only), and connector (all routers) associated with this NHRP interface

State	The configured state of this interface. A disabled interface cannot be selected as the active interface for a circuit.
Type	The type of VC that the NHRP client (NHC) will establish if no encapsulation type has been specified for the virtual channel identifier (VCI)

show nhrp server configuration

The **show nhrp server configuration** command displays configuration information about the NHRP server on the router. When you enter this command, the BCC displays the following information:

Forward Enable	The configured state of NHRP server request forwarding (enabled or disabled)
Link Protocol	The type of layer 2 protocol (ATM)
Network Protocol	The type of layer 3 protocol (IP)
NH Max Entries	The maximum number of next-hop entries to keep. If the NH Resolution Reply message contains a number of entries greater than the specified maximum, the excess entries will be discarded.
NH Cache Size	The maximum number of next-hop entries held in the cache
Pending Requests	The maximum number of pending requests allowed for this NHRP server
Server Enable	The configured state of the NHRP server

show nhrp server stats

The **show nhrp server stats** command displays statistical information about the NHRP server on the router. When you enter this command, the BCC displays the following information:

Link Protocol	The layer 2 protocol (ATM) associated with this server
Network Protocol	The layer 3 protocol (IP) associated with this server
Resolve Request Rx	The number of NHRP resolution requests received by this server
Resolve Reply ACK Tx	The number of positively acknowledged NHRP resolution replies transmitted by this server

Resolve Reply NAK Tx	The number of negatively acknowledged (NAKed) NHRP resolution replies transmitted by this server
Resolve Request Fwd	The number of NHRP resolution requests forwarded by this server acting as a transit NHS
Resolve Reply Fwd	The number of NHRP resolution replies forwarded by this server acting as a transit NHS
Register Request Rx	The number of NHRP registration requests received by this server
Register Reply ACK Tx	The number of positively acknowledged (ACKed) NHRP registration replies transmitted by this server
Register Reply NAK Tx	The number of negatively acknowledged (NAKed) NHRP registration replies transmitted by this server
Register Request Fwd	The number of NHRP registration requests forwarded by this server acting as a transit NHS
Register Reply Fwd	The number of NHRP registration replies forwarded by this server acting as a transit NHS
Purge Request Rx	The number of NHRP purge requests received by this server
Purge Reply ACK Tx	The number of positive NHRP purge replies transmitted by this server
Purge Reply NAK Tx	The number of negatively acknowledged (NAKed) NHRP purge replies transmitted by this server
Purge Request Fwd	The number of NHRP purge requests forwarded by this server acting as a transit NHS
Purge Reply Fwd	The number of NHRP purge replies forwarded by this server acting as a transit NHS
Errors Rx	The number of NHRP error indication packets received by this server with the error code “Unrecognized Extension”
Errors Tx	The number of NHRP error indication packets received by this server with the error code “Subnetwork ID Mismatch”
Errors Fwd	The number of NHRP error indication packets forwarded by this server acting as a transit NHS
Dropped Packets	The number of packets dropped by this NHS
NH Cache Size	The maximum number of next-hop entries to be cached
NH Entries	The current number of next-hop cache entries

Appendix D
Example Configuration

This appendix shows how to configure MPOA/NHRP services on two Nortel Networks BLN routers, each supporting an MPS in an ATM network. The example presents the BCC configuration sequence and parameter values for each required MPOA/NHRP entity.

Configuration Diagram

The example configuration in Figure D-1 shows two MPSs serving two MPCs in an ATM network. In this example, a network administrator configured an ATM interface on slot 5 of each BLN router. All three ELANs emulate an IEEE 802.3 LAN. Table D-1 summarizes key information for creating this configuration.

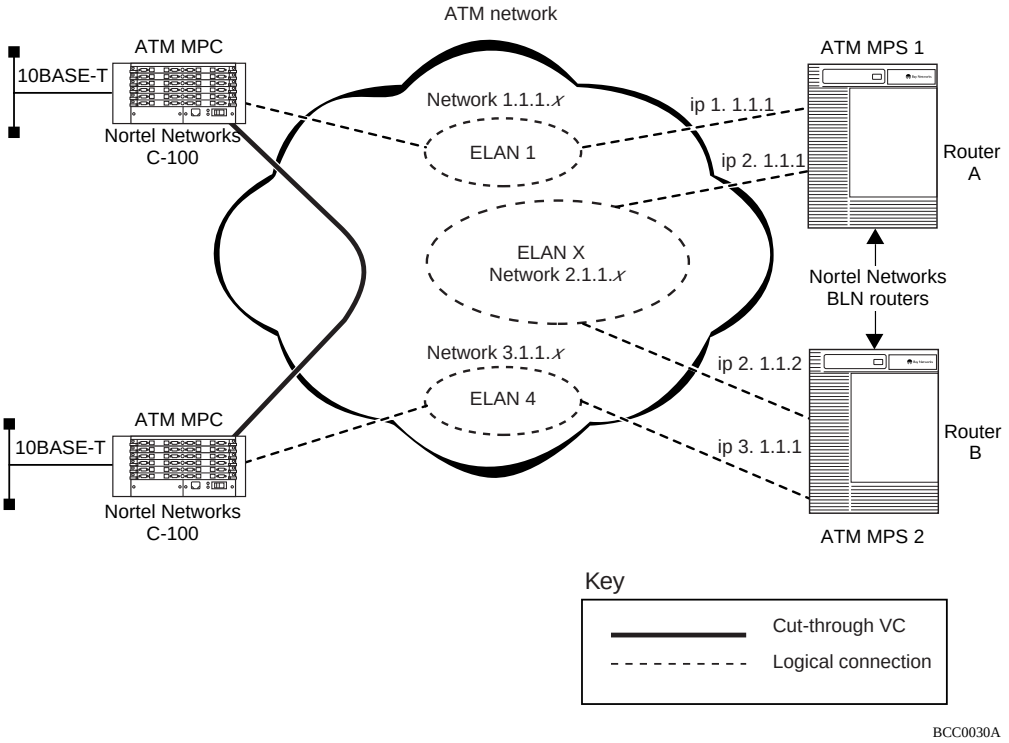


Figure D-1. Example MPOA/NHRP Configuration

Table D-1. Example Configuration Summary

Network Element	Description
MPC1	Nortel Networks C-100 Switch
MPC2	Nortel Networks C-100 Switch
ELAN 1 network address	1.1.1.x
ELAN X network address	2.1.1.x
ELAN 2 network address	3.1.1.x
MPS1	Nortel Networks BLN Router
• MPOA service	Enabled on ATM slot 5, connector 1
• MPS1 ATM address	Autogenerated
• IP interface to ELAN 1	1.1.1.1/255.255.255.0
• IP interface to ELAN X	2.1.1.1/255.255.255.0
• NHRP	Enabled on the IP interface to ELAN 1 and ELAN X
MPS2	Nortel Networks BLN Router
• MPOA service	Enabled on ATM slot 5, connector 1
• MPS2 ATM address	Autogenerated
• IP interface to ELAN X	2.1.1.2/255.255.255.0
• IP interface to ELAN 2	3.1.1.1/255.255.255.0
• NHRP	Enabled on the IP interface to ELAN 2 and ELAN X

BCC Configuration Sequence

The following command sequence implements the example configuration described in Figure D-1 and Table D-1. The example assumes that you have already logged on to Router A.

1. Start the BCC interface.

```
[2:1]LAB2$ bcc

    Welcome to the Bay Command Console!

     * To enter configuration mode, type config

     * To list all system commands, type ?

     * To exit the BCC, type exit
```

2. Enter BCC configuration mode.

```
bcc> config
Reading configuration information, please wait . . . done.
box#
```

3. Identify ATM interface slots.

```
box# lso
atm/5/1         board/5         ftp             snmp
board/1         console/1       ip              telnet
board/2         ethernet/2/1    tftp
```

4. Go to the ATM interface configured on slot 5, connector 1.

```
box# atm 5/1
atm/5/1#
```

5. **Enable signaling on the ATM interface.**

```
atm/5/1# signaling
signaling/5/1#
```

6. **Check for the correct UNI version, which must agree with the UNI version used by the network switch.**

```
signaling/5/1# uni-version
  uni-version v30
signaling/5/1#
```

7. **Reset the UNI version.**

```
signaling/5/1# uni-version v31
signaling/5/1#
```

8. **Go back to the ATM interface context.**

```
signaling/5/1# back
atm/5/1#
```

9. **Create an MPOA service record on the ATM interface.**

```
atm/5/1# mpoa-service
mpoa-service/5/1#
```

10. **Create an MPOA server named “mps1.”**

```
mpoa-service/5/1# mps mps1
mps/mps1#
```

11. **Go back to the ATM interface context.**

```
mps/mps1# back
mpoa-service/5/1# back
atm/5/1#
```

12. **Create an LEC service record on the ATM interface.**

```
atm/5/1# lec-service lane_e1
lec-service/lane_e1#
```

13. Create an mpoa-server mapping object on this LEC service.

```
lec-service/lane_e1# mpoa-server mpsname mps1
mpoa-server/lane_e1#
```

The mpoa-server object maps this LEC service to a specific MPOA server, MPS1.

14. Go back to the LEC service record.

```
mpoa-server/lane_e1# back
lec-service/lane_e1#
```

15. Enable NHRP and IP on the LEC service record.

```
lec-service/lane_e1# nhrp
nhrp/lane_e1# back
lec-service/lane_e1# ip 1.1.1.1/255.255.255.0
```

16. Go back to the ATM interface context and create a LEC service for ELAN X.

```
ip/1.1.1.1/255.255.255.0# back
lec-service/lane_e1# back
atm/5/1# lec-service lane_ex
```

17. Create an mpoa-server object on this LEC service.

```
lec-service/lane_ex# mpoa-server mpsname mps1
mpoa-server/lane_ex#
```

The mpoa-server object maps this LEC service to an MPOA server, which in this case is the same one mapped to lec-service/lane_e1.

18. Go back to the LEC service record.

```
mpoa-server/lane_ex# back
lec-service/lane_ex#
```

19. Enable NHRP and IP on the LEC service record.

```
lec-service/lane_ex# nhrp
nhrp/lane_ex# back
lec-service/lane_ex# ip 2.1.1.1/255.255.255.0
```

20. Go back to root level and display the entire router configuration recursively in verbose mode. This reveals the current settings for the parameters of every configured object.

```
box# show config -r -v
box
    type freln
   build-version {BayRS 13.20/int24 BCC 4.20/int24 builder vobadm}
    contact {}
    system-name {}
    location {}
    mib-counters enabled
    help-file-name {}
    console-slot-mask {1 2 3 4 5 6 7 8 9 10 11 12 13 14}
  board slot 1
      type srml
  back
  board slot 2
      type esafnf
  back
  board slot 5
      type atmcoc3mm
  back
    .     .     .
    .     .     .
    .     .     .
  nhrp
      client enabled
      client-registration-interval 25
      client-hold-time 30
      client-request-timeout 10
      client-request-retry 3
      client-requests-maximum 100
      server enabled
      server-forwarding enabled
    .     .     .
    .     .     .
    .     .     .
```

21. **Print the output of the show config command to a file that you can later import into the router using the BCC source command.**

```
box# show config -file 2:atm.cfg1
```

22. **Exit the BCC interface.**

```
box# exit
bcc> exit
```

23. **Go back to step 1 and repeat the procedure for MPS2, as described in Table D-1 on page D-3.**

Appendix E
BCC Configuration Tree for MPOA and NHRP

Figure E-1 shows the BCC configuration tree for objects associated with MPOA and NHRP services. Use the diagram as an aid for navigating to and from MPOA and NHRP objects that you create in the router configuration.

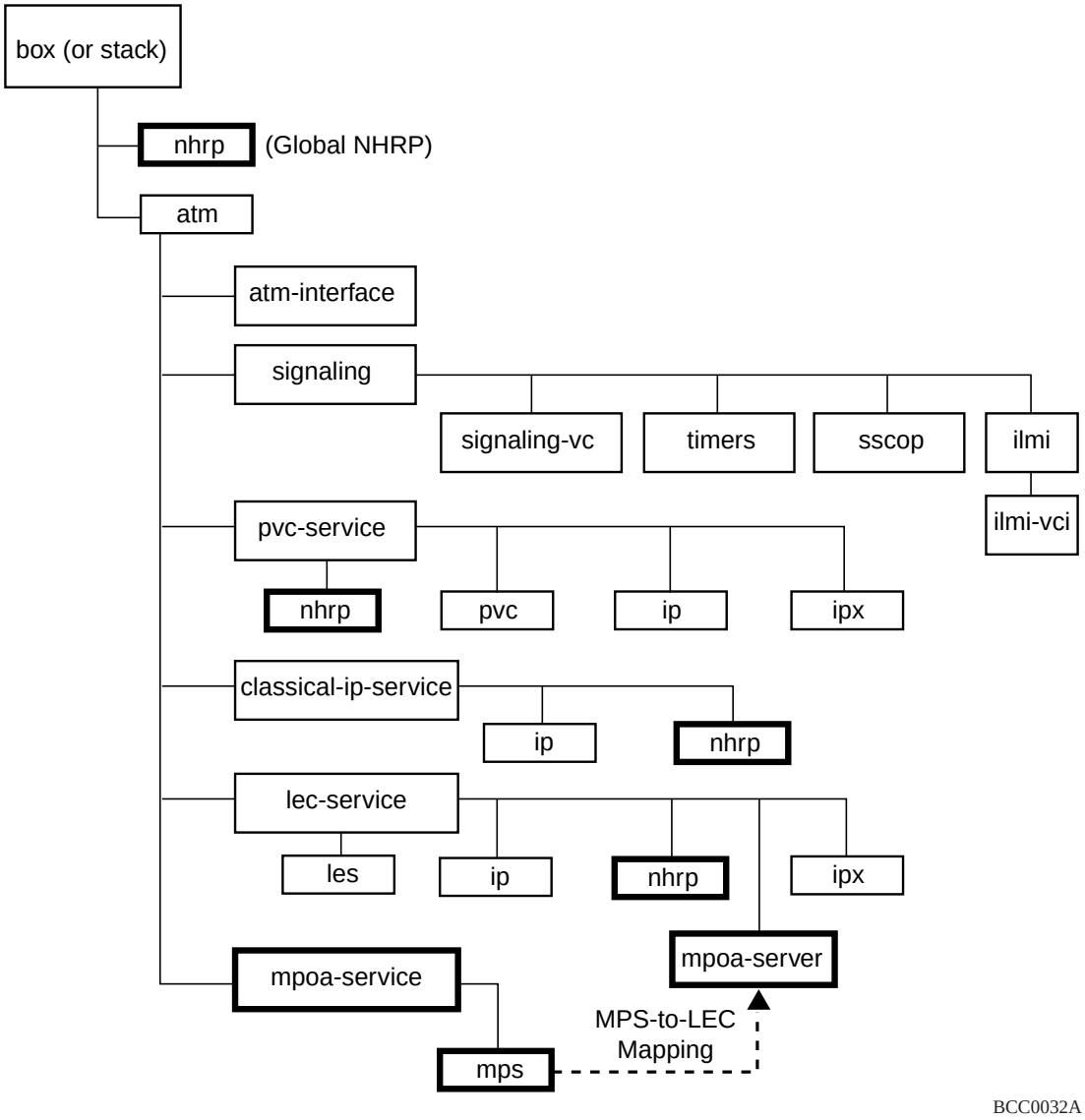


Figure E-1. BCC Configuration Tree for MPOA and NHRP

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